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医用 IT 系统绝缘监测及故障定位产品
(七件套)

Medical IT System Insulation Monitoring and Fault Locating Products
(Seven-Piece Set)

安装使用说明书 V2.3
Installation and Operation Manual V2.3

安科瑞电气股份有限公司
Acrel Electric Co., Ltd.

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更改履历

Revision history

次数	更改日期	更改后版次	更改原因
01	2016.1.20	V2.0	在原来绝缘监测产品的基础上，把所有七件套产品的内容都整合进来，以完全替代各分产品的说明书。
02	2016.11.7	V2.2	概述中增加了“产品符合企业标准Q31/0114000129C013-2016《IT系统绝缘监测仪》的规定”
03	2017.6.27	V2.2	产品接线图进行了优化整改。
04	2018.5.23	V2.3	修改了产品接线图
Number of times	Revision date	Versions after revision	Reasons for revision
01	2016.1.20	V2.0	On the basis of the original insulation monitoring products, all seven pieces of products are integrated into the content to completely replace the specifications of the products.
02	2016.11.7	V2.1	The overview added "products conform to Enterprise standards Q31/0114000129C013-2016 <i>IT System Insulation Monitoring Instrument</i> ".
03	2017.6.27	V2.2	The wiring diagram of the product is optimized.
03	2018.5.23	V2.3	The wiring diagram of the product is modified.
备注： Note:			

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医用 IT 系统绝缘监测及故障定位产品

Medical IT System Insulation Monitoring and Fault Locating Products

1 概述

1 Introduction

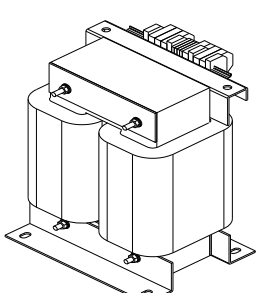
医用IT系统主要应用于诸如手术室、ICU/CCU重症监护室等重要的医疗2类场所，为这些场所的重要设备提供安全、可靠、连续的配电。医用绝缘监测及故障定位装置是安科瑞电气集多年电力仪表行业的设计经验，根据医疗2类场所对配电系统绝缘监测和故障定位的特殊要求而开发的。产品可实现IT系统的绝缘、负载和隔离变压器温度等状况的实时监测，并具有系统绝缘故障回路定位和多套系统集中监控等功能。产品符合企业标准Q31/0114000129C013-2016《IT系统绝缘监测仪》的规定。

The medical IT system is mainly used in important Class 2 medical locations such as operating room, ICU/CCU intensive care unit, providing safe, reliable and continuous power distribution for the important equipment at these locations. Medical insulation monitoring and fault locating device is developed by the many years' design experience of the Acrel Electric in electric power meter industry, according to the special requirements of the insulation monitoring and fault locating of the power distribution system in Class 2 medical locations. The products can realize the real-time monitoring of insulation, load and temperature of isolation transformer in IT system, and have the functions of system insulation fault loop positioning and centralized monitoring by multiple pieces of systems. Products conform to the provisions of enterprise standard Q31/0114000129C013-2016 *IT System Insulation Monitoring Instrument*.

医用IT系统绝缘监测及故障定位产品（七件套）包括AITR系列医用隔离变压器、AIM-M200医疗智能绝缘监测仪、AKH-0.66P26电流互感器、AIL100-4/AIL100-8绝缘故障定位仪、ASG100测试信号发生器、DR-60-24电源模块和AID200集中报警与显示仪等，产品如表1所示。

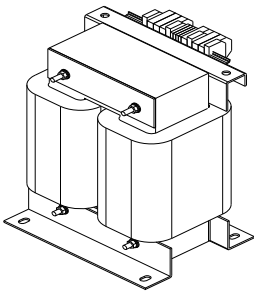


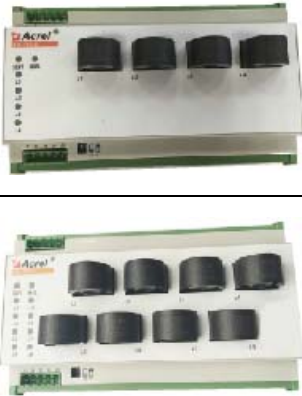
Medical IT system insulation monitoring and fault locating products (seven-piece set) include AITR series medical isolation transformer, AIM-M200 medical intelligent insulation monitoring instrument, AKH-0.66P26 current transformer, AIL100-4/AIL100-8 insulation fault locator, ASG100 test signal generator, DR-60-24 power module and AID200 centralized alarm and display instrument, which are shown in Table 1.




表 1 医用 IT 系统绝缘监测及故障定位产品

名称及型号	产品图片	说明
AITR系列医用隔离变压器		AITR系列隔离变压器专用于医疗IT系统，铁芯采用日本进口的硅钢片叠加而成，损耗很小。绕组间采用了双重绝缘处理，并设有静电屏蔽层，减少了绕组间的电磁干扰。线包内安装了PT100温度传感器，用于监测变压器温度。整体采用真空浸漆处理，增加了机械强度和抗腐蚀性。产品具有很好的温升性能和很低的噪声。

<p>AIM-M200医疗智能绝缘监测仪</p>		<p>AIM-M200医疗智能绝缘监测仪采用先进的微控制器技术，集成度高，体积小巧，安装方便，集智能化、数字化、网络化于一身，是手术室、重症监护室等医疗2类场所隔离电源系统绝缘监测的理想选择。</p>
<p>AKH-0.66P26电流互感器</p>		<p>AKH-0.66P26型电流互感器是与AIM-M200绝缘监测仪配套使用的保护型电流互感器，最大可测电流为60A，变比是2000:1，电流互感器采用螺丝直接固定的方式装于机柜内部，二次侧通过接线柱引出，安装和使用方便。</p>
<p>AIL100-4/AIL100-8绝缘故障定位仪</p>		<p>AIL100-4/AIL100-8绝缘故障定位仪采用高灵敏度互感器配合高精度的信号检测电路，检测ASG100测试信号发生器注入系统中的信号，准确定位绝缘故障所在的回路。其中AIL100-4绝缘故障定位仪能定位4个回路的绝缘故障，AIL100-8绝缘故障定位仪能定位8个回路的绝缘故障。</p>
<p>ASG100测试信号发生器</p>		<p>ASG100测试信号发生器采用32位微处理器芯片和高精度的信号产生电路，实现特定测试信号的产生。当被监测的IT系统出现绝缘故障时，能及时启动并产生测试信号，配合绝缘故障定位仪实现绝缘故障定位。</p>
<p>DR-60-24电源模块</p>		<p>DR-60-24直流稳压电源可同时为AIM-M200医用智能绝缘监测仪、ASG100测试信号发生器、AIL100系列绝缘故障定位仪和AID200集中报警与显示仪等仪表提供直流24V电源。该电源功率大、电压输出稳定、安装方便，可满足上述仪表的供电要求，是推荐的电源产品。</p>
<p>AID200集中报警与显示仪</p>		<p>AID200集中报警与显示仪采用LCD液晶显示，采用自定义协议的CAN通讯接口与AIM-M200医疗智能绝缘监测仪实现数据信息交换，可实时监控多路AIM-M200医疗智能绝缘监测仪的数据。</p>

Table 1 Medical IT System Insulation Monitoring and Fault Locating Products

Product name and type	Product picture	Description
AITR series medical isolation transformer		<p>AITR series isolation transformer is specially used in medical IT system, and the core superposition adopts the silicon steel sheet imported from Japan, which has very small losses. The windings are treated with double insulation and have electrostatic shielding layer, which reduces electromagnetic interference between windings. The PT100 temperature sensor is installed in the wire bag to monitor the temperature of transformer. The whole body is treated with vacuum invasion paint, which increases mechanical strength and corrosion resistance. The product has good temperature rise performance and very low noise.</p>
AIM-M200 medical intelligent insulation monitoring instrument		<p>AIM-M200 medical intelligent insulation monitoring instrument adopts advanced microcontroller technology, which has high integration, compact size, convenient installation and integrates intelligence, digitalization and networking in one. It is ideal selection for insulation monitoring of isolation power system in Class 2 medical locations such as operating room and intensive care unit.</p>
AKH-0.66P26 current transformer		<p>The AKH-0.66P26 type current transformer is the protective current transformer supporting the AIM-M200 insulation monitor, of which the maximum measurable current is 60A and the transformation ratio is 2000:1. The current transformer is directly fixed inside cabinet by screwing, and the secondary side is leaded out by the terminal, which is convenient to install and use.</p>
AIL100-4/AIL100-8 insulation fault locator		<p>AIL100-4/AIL100-8 insulation fault locator adopts high sensitivity transformer combined with high precision signal detecting circuit, which detects the signal imported into the system from ASG100 test signal generator and accurately locates the circuits which have insulation faults. AIL100-4 insulation fault locator can locate the insulation faults of 4 circuits, and the AIL100-8 insulation fault locator can locate the insulation faults of 8 circuits.</p>

<p>ASG100 test signal generator</p>		<p>The ASG100 test signal generator adopts 32-bit microprocessor chip and high-precision signal generation circuit to realize the generation of specific test signal. When the monitored IT system has insulation faults, it can start up and produce test signal in time, working with the insulation fault locator to realize insulation fault location.。</p>
<p>DR-60-24 power module</p>		<p>DR-60-24 direct-current power supply can provide 24V DC power supply simultaneously for AIM-M200 medical intelligent insulation monitoring instrument, ASG100 test signal generator, AIL100 series insulation fault locator and AID200 centralized alarm and display instrument. The power supply is of high capacity, stable voltage output and convenient installation, which can meet the power-supply requirements of the above-mentioned meters and is the recommended power supply product.</p>
<p>AID200 centralized alarm and display instrument</p>		<p>AID200 centralized alarm and display instrument adopts the LCD liquid crystal display and achieves data exchange with AIM-M200 medical intelligent insulation monitoring instrument through CAN communication interface of self-defined protocol, which can real-time monitor multi-channel data of AIM-M200 medical intelligent insulation monitoring instrument.</p>

2 功能特点

2 Function features

2.1 AITR 系列医用隔离变压器功能特点

2.1 Function features of AITR series medical isolation transformer

- 初次级绕组之间的变比为1: 1;
- 绕组与绕组之间采用了双重绝缘处理, 并设计了静电屏蔽层;
- 每个线包内均安装了PT100温度传感器, 用于监测隔离变压器的温度;
- 用于将TN系统经隔离变压器后, 转接成IT系统(不接地系统)。
- The transformation ratio between the primary and secondary windings is 1:1;
- Double insulation treatment is adopted between the windings, and the electrostatic shielding layer is designed.

- The PT100 temperature sensor is installed in each wire packet to monitor the temperature of the isolation transformer;
- Used for the transformation of TN system into IT system (ungrounded system) after isolation transformer.

2.2 AIM-M200 医疗智能绝缘监测仪功能特点

2.2 Function features of AIM-M200 medical intelligent insulation monitoring instrument

- 具有对被监测IT系统对地绝缘电阻、变压器负荷电流、变压器绕组温度实时监测与故障报警功能；
- 可与绝缘故障定位装置配套使用，在绝缘故障时可远程启动故障定位，并显示定位结果；
- 能实时监测与被测系统连线断线故障、温度传感器断线故障以及功能接地线断线故障，并在故障发生时给出报警指示；
- 继电器报警输出、LED报警指示等多种故障指示功能；
- 采用两种现场总线通讯技术，分别用于集中报警与显示仪、测试信号发生器、绝缘故障定位仪以及上位机管理软件通讯，可以实时监控IT系统的运行状况；
- 具有事件记录功能，能够记录报警发生的时间和故障类型，方便操作人员分析系统运行状况，及时消除故障；
- Functions of real-time monitoring and fault alarming of the ground insulation resistance, transformer load current and transformer winding temperature of the monitored IT system;
- Can be used with insulation fault locator, remotely starting fault-locating and displaying locating results when there are insulation faults;
- Real-time monitor the line disconnection fault, temperature sensor disconnection fault and the functional grounding line disconnection fault of the monitored system, and give the alarm indication when the fault occurs;
- Relay alarm output, LED alarm indication and other faults indication functions;
- Two kinds of fieldbus communication technology, which are used for centralized alarm and display instrument, test signal generator, insulation fault locator and upper computer management software communications, and can monitor the operation status of IT system in real time.
- Events logging function, which can record alarm occurrence time and fault type and is convenient for operation personnel to analyze the operation conditions of system and promptly eliminate the faults;

2.3 ASG100 测试信号发生器

2.3 ASG100 test signal generator

- 采用CAN总线技术，可与其它设备进行数据交互；
- 当被监测的IT系统出现绝缘故障时，能启动并产生故障定位信号注入系统中，配合故障定位仪实现故障定位功能；
- 具有L1，L2断线检测功能，并可通过发光二极管指示。

- The CAN bus technology is used to exchange data with other equipment.
- When the monitored IT system has an insulation fault, it can initiate and generate the fault location signal to the system, and realize fault locating function with the help of fault locator;
- Functions of L1, L2 disconnection detection, and can display the results through the luminous LED.

2.4 AIL100-4/AIL100-8 绝缘故障定位仪

2.4 AIL100-4/AIL100-8 insulation fault locator

- 采用CAN总线技术，可与其它设备进行数据交互；
- 可与ASG100测试信号发生器配合，实现故障定位功能。其中，AIL100-4可定位4个回路的绝缘故障，AIL100-8可定位8个回路的绝缘故障。定位回路通过LED指示灯指示。
- The CAN bus technology is used to exchange data with other equipment.
- Cooperate with ASG100 test signal generator to realize fault locating function, in which the AIL100-4 can locate the insulation faults of 4 circuits and AIL100-8 can locate the insulation faults of 8 circuits. The positioned circuit is indicated by the LED indicator.

2.5 AID200 集中报警与显示仪功能特点

2.5 Function features of AID200 centralized alarm and display instrument

- 可以远程监测多达16套系统实时的运行状况，主界面直观显示接入系统通讯是否完好；
- 可以对各系统绝缘监测仪的绝缘电阻报警值、负荷电流报警值和变压器温度报警值进行远程设置，并可远程启动绝缘监测仪自检；
- 当被监测的任一系统出现绝缘故障、过负载、变压器温升过高或接线故障时，集中报警与显示仪提供相应的声光报警功能，并可手动消除报警声音。
- 具有事件记录功能，方便操作人员分析系统运行状况，及时消除故障，最多可保存最新的20条记录；
- Remotely monitor the real-time operation conditions of up to 16 pieces of systems, and the main interface intuitively displays whether the access system communication is intact;
- The insulation resistance alarm value, load current alarm value and transformer temperature alarm value of each system insulation monitoring instrument can be set up remotely, and the insulation monitor self-test can be activated remotely.
- When there are insulation faults, overload, excessive temperature rise of the voltage transformer or wiring faults in any of the monitored system, centralized alarm and display instrument can provide corresponding sound and light alarm function, and can manually eliminate the alarm sound.
- Events logging function, which is convenient for operation personnel to analyze the operation conditions of system and promptly eliminate the faults, and can save maximum of 20 newest records;

2.6 DR-60-24 仪用电源功能特点

2.6 Function features of DR-60-24 power supply instrument

- 交流220V输入，直流24V输出，最大输出功率为60W；
- 用于为AIM-M200医用智能绝缘监测仪、ASG100测试信号发生器、AIL100系列绝缘故障定位仪和AID200集中报警与显示仪等仪表提供直流24V电源。
- AC 220V input, DC 24V output, with max output power of 60W;
- Used for the DC 24V power supply for AIM-M200 medical intelligent insulation monitoring instrument, ASG100 test signal generator, AIL100 series insulation fault locator, AID200 centralized alarm and display instrument and other instruments.

2.7 AKH-0.66P26 电流互感器功能特点

2.7 Function features of AKH-0.66P26 current transformer

- 最大可测电流为60A，变比是2000: 1；
- 与AIM-M200绝缘监测仪配套，测量隔离变压器的负载电流。
- The maximum measurable current is 60A, and the transformation change ratio is 2000:1;
- Work with the AIM-M200 insulation monitoring instrument to measure the load current of isolation transformer.

3 参考标准

3 Reference standard

- ◆ GB 16895.24-2005/IEC 60364-7-710:2002 《建筑物电气装置第7-710部分：特殊装置或场所的要求—医疗场所》；
- ◆ IEC 61557-8-2007 《交流1000V和直流1500V以下低压配电系统电气安全防护检测的试验、测量或监控设备 第8部分：IT系统用绝缘监测装置》；
- ◆ IEC 61557-9-2007 《交流1000V和直流1500V以下低压配电系统电气安全防护检测的试验、测量或监控设备 第9部分：IT系统用绝缘故障定位设备》；
- ◆ JGJ 16-2008 《民用建筑电气设计规范》；
- ◆ GB19212.1-2008/IEC61558-1: 2005 《电力变压器、电源、电抗器和类似产品的安全 第1部分：通用要求和试验》；
- ◆ GB19212.16-2005/IEC61558-2-15: 1999 《电力变压器、电源装置和类似产品的安全 第16部分：医疗场所供电用隔离变压器的特殊要求》。
- ◆ GB 16895.24-2005/IEC 60364-7-710: 2002 *Building electrical installations section 7-710: Requirements for special installations or locations---medical locations;*

- ◆ IEC 61557-8-2007 *Electrical safety of low voltage distribution system below AC 1000V and DC 1500V, Test, measurement or monitoring equipment for protection test section 8: Insulation monitoring device for IT systems;*
- ◆ IEC 61557-9-2007 *Electrical safety of low voltage distribution system below AC 1000V and DC 1500V, Test, measurement or monitoring equipment for protection test section 9: insulation fault positioning equipment for IT systems;*
- ◆ JGJ 16-2008 *Code for electrical design of civil buildings;*
- ◆ GB19212.1-2008/IEC61558-1: 2005 *Safety of power transformers, power supplies, reactors and similar products section 1: General requirements and tests;*
- ◆ GB19212.16-2005/IEC61558-2-15: 1999 *Safety of power transformers, power supplies and similar products section 16: Special requirements for isolation transformers for power supply in medical locations.*

4 技术参数

4 Technical parameters

4.1 AITR 系列医用隔离变压器技术参数

4.1 Technical parameters of AITR series medical isolation transformer

见表2。

Refer to Table 2.

表 2 AITR 系列隔离变压器技术参数表

型号	AITR10000	AITR8000	AITR6300	AITR5000	AITR3150
绝缘等级	H	H	H	H	H
保护等级	IP00	IP00	IP00	IP00	IP00
功率/电压/电流					
额定功率	10000VA	8000VA	6300VA	5000VA	3150VA
额定频率	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz
额定输入电压	AC230V	AC230V	AC230V	AC230V	AC230V
额定输入电流	45.3A	36A	28.5A	22.5	14.2A
额定输出电压	AC230V/115V	AC230V/115V	AC230V/115V	AC230V/115V	AC230V/115V
额定输出电流	43.5A	34.7A	27.4A	21.7	13.7A
涌流	<12In	<12In	<12In	<12In	<12In
泄露电流	<200 μ A	<200 μ A	<200 μ A	<200 μ A	<200 μ A
空载输入电流	1.359A	1.08A	0.855A	0.675A	0.426A
空载输出电压	235V \pm 3%	235V \pm 3%	235V \pm 3%	235V \pm 3%	235V \pm 3%
短路电压	<6.9V	<6.9V	<6.9V	<6.9V	<7.5V
通用参数					
熔丝	80A	63A	50A	35A	25A
初级绕组电阻	<55m Ω	<64m Ω	<80m Ω	<131 m Ω	<245m Ω

次级绕组电阻	<45mΩ	<64mΩ	<80mΩ	<116 mΩ	<228mΩ
铁损	<150W	<105W	<107W	<77W	<55W
铜损	<230W	<200W	<170W	<125W	<120W
效率	>96%	>96%	>96%	>96%	>95%
最高环境温度	<40℃	<40℃	<40℃	<40℃	<40℃
空载温升	<36℃	<33℃	<31℃	<26℃	<22℃
满负荷温升	<65℃	<76℃	<67℃	<62℃	<55℃
噪声等级	<40dB	<40dB	<40dB	<40dB	<40dB

Table 2 Technical Parameters of AITR Series of Medical Isolation Transformer

Type	AITR10000	AITR8000	AITR6300	AITR5000	AITR3150
Insulation class	H	H	H	H	H
Protection class	IP00	IP00	IP00	IP00	IP00
Power / voltage / current					
Rated power	10000VA	8000VA	6300VA	5000VA	3150VA
Rated frequency	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz
Rated input voltage	AC230V	AC230V	AC230V	AC230V	AC230V
Rated input current	45.3A	36A	28.5A	22.5	14.2A
Rated output voltage	AC230V/115V	AC230V/115V	AC230V/115V	AC230V/115V	AC230V/115V
Rated output current	43.5A	34.7A	27.4A	21.7	13.7A
Inrush current	<12In	<12In	<12In	<12In	<12In
Leakage current	<200μA	<200μA	<200μA	<200μA	<200μA
No load input current	1.359A	1.08A	0.855A	0.675A	0.426A
No load output voltage	235V±3%	235V±3%	235V±3%	235V±3%	235V±3%
Short circuit voltage	<6.9V	<6.9V	<6.9V	<6.9V	<7.5V
General parameters					
Fuse wire	80A	63A	50A	35A	25A
Primary winding resistance	<55mΩ	<64mΩ	<80mΩ	<131 mΩ	<245mΩ
Secondary winding resistance	<45mΩ	<64mΩ	<80mΩ	<116 mΩ	<228mΩ
Iron loss	<150W	<105W	<107W	<77W	<55W
Copper loss	<230W	<200W	<170W	<125W	<120W

Efficiency	>96%	>96%	>96%	>96%	>95%
Maximum ambient temperature	<40°C	<40°C	<40°C	<40°C	<40°C
No-load temperature rise	<36°C	<33°C	<31°C	<26°C	<22°C
Full load temperature rise	<65°C	<76°C	<67°C	<62°C	<55°C
Noise grade	<40dB	<40dB	<40dB	<40dB	<40dB

4.2 AIM-M200 医疗智能绝缘监测仪技术参数

4.2 Technical parameters of AIM-M200 medical intelligent insulation monitoring instrument

见表3。

Refer to Table 3.

表3 AIM-M200 医疗智能绝缘监测仪技术参数

辅助电源	电压	DC24V±25%	温度监测	热敏电阻	2个Pt100
	最大功耗	<3W		测量范围	-50—+200°C
绝缘监测	电阻测量范围	10-999kΩ		报警值范围	0—+200°C
	相对百分比误差	0—±10%	报警输出	输出方式	2路继电器输出
	报警值范围	50—999kΩ		触点容量	AC 250V/3A DC 30V/3A
	响应时间	<2s	环境	工作温度	-10—+55°C
	测量电压	<12V		存储温度	-20—+70°C
	测量电流	<50uA		相对湿度	5%-95%，不结露
电流监测	测量范围	2.1-50A		海拔高度	≤2500m
	报警值范围	5-50A	通讯	CAN接口，自定义协议	
	测量精度	5级		RS485接口，Modbus-RTU协议	
EMC电磁兼容/电磁辐射		符合IEC 61326-2-4	额定冲击电压/污染等级		4KV/III

Table 3 Technical Parameters of AIM-M200 Medical Intelligent Insulation Monitoring

Auxiliary power	Voltage	DC24V±25%	Temperature monitoring	Thermal resistor	Two Pt100
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supply	Maximum power consumption	<3W		Measurement range	-50—+200℃
Insulation monitoring	Resistance measuring range	10-999kΩ		Alarm value range	0—+200℃
	Relative percentage error	0—±10%	Alarm output	Output mode	Two lines relay outputs
	Alarm value range	50—999kΩ		Contact rating	AC 250V/3A DC 30V/3A
	Response time	<2s	Environment	Operating temperature	-10—+55℃
	Measuring voltage	<12V		Storage temperature	-20—+70℃
	Measuring current	<50uA		Relative humidity	5%-95%, No condensing
Current monitoring	Measurement range	2.1-50A		Communication	Elevation
	Alarm value range	5-50A	CAN interface, self-defined protocol		
	Measurement accuracy	5级	RS485 interface, Modbus-RTU protocol		
EMC Electromagnetic compatibility/Electromagnetic radiation		conform to IEC 61326-2-4		Rated impulse voltage / level of contamination	4KV/III

4.3 ASG100、AIL100-4/AIL100-8 测试信号发生器技术参数

4.3 Technical parameters of ASG100, AIL100-4/AIL100-8 test signal generator

见表4。

Refer to Table 4.

表 4 ASG100、AIL100-4/AIL100-8 测试信号发生器技术参数

项目		技术参数	
		ASG100	AIL100-4/AIL100-8
辅助电源	电压	DC24V(±25%)	
	最大功率	≤2VA	
被监测系统	额定电压	AC 220 V(±10%)	
	额定频率	45 ~ 60Hz	
定位信号	定位电压	<25V a.c.r.m.s.	—
	定位电流	<1mA r.m.s.	—
故障定位	最大回路数	—	4路、8路
	响应时间	—	<2s
通讯	方式	CAN通讯	
	协议	自定义协议	

Table 4 Technical Parameters of ASG100, AIL100-4/AIL100-8 Test Signal Generator

Item		Technical parameters	
		ASG100	AIL100-4/AIL100-8
Auxiliary power supply	Voltage	DC24V(±25%)	
	Maximum power consumption	≤2VA	
Monitored system	Rated voltage	AC 220 V(±10%)	
	Rated frequency	45 ~ 60Hz	
Locating signals	Locating voltage	<25V a.c.r.m.s.	—
	Locating current	<1mA r.m.s.	—
Fault locating	Maximum circuit	—	Four circuits, eight circuits
	Response time	—	<2s
Communication	Mode	CAN communication	
	Protocol	Self-defined protocol	

4.4 AID200 集中报警与显示仪技术参数

4.4 Technical parameters of AID200 centralized alarm and display instrument

见表5。

Refer to Table 5.

表 5 AID200 集中报警与显示仪技术参数

辅助电源	电压	DC 24V(可波动范围±5%)
	功耗	< 2VA
远程报警参数设置	绝缘报警范围	50—999kΩ
	电流报警范围	14A、18A、22A、28A、35A、45A
	温度报警范围	0—200 °C
故障报警	报警方式	声光报警
	报警类型	绝缘故障、过负荷、超温。
显示方式	LCD液晶显示，128*64点阵	
最大支持IT系统数	16个	
通讯方式	CAN通讯，自定义协议	

Table 5 Technical Parameters of AID200 Centralized Alarm and Display Instrument

Auxiliary power supply	Voltage	DC 24V (range of fluctuation ± 5%)
	Power consumption	< 2VA
Remote alarm parameter settings	Insulation alarm range	50—999kΩ
	Current alarm range	14A、18A、22A、28A、35A、45A
	Temperature alarm range	0—200 °C
Fault alarm	Alarm mode	Sound and light alarm
	Alarm type	Insulation fault, overload, and over temperature
Display mode	LCD liquid crystal display, 128*64 dot array	
Maximum number of supporting IT systems	16	
Communication mode	CAN communication, self-defined protocol	

4.5 DR-60-24 仪用电源技术参数

4.5 Technical parameters of DR-60-24 power supply instrument

见表6。

Refer to Table 6.

表 6 DR-60-24 仪用电源技术参数

型号	输入	输出	安装方式
DR-60-24	100-240VAC 1.8A	24VDC 2.5A	35mm导轨安装

Table 6 Technical Parameters of DR-60-24 Power Supply Device

Type	Input	Output	Installation method
DR-60-24	100-240VAC 1.8A	24VDC 2.5A	35mm track installation

4.6 AKH-0.66P26 电流互感器技术参数

4.6 Technical parameters of AKH-0.66P26 current transformer

见表7。

Refer to Table 7.

表 7 AKH-0.66P26 电流互感器技术参数

输入电流	0.5mA~50A	使用频率范围	0.02-10 kHz
输出电流	0.025~25 mA	负载电阻	<200Ω
温度系数	100 ppm/°C	瞬间电流1s	200A
相移	10'	安装固定	十字槽盘头4×10螺丝固定
工作温度	-35~+70°C	二次侧接线	单芯线>0.75mm ² 错误! 未找到引用源。 , 最长1m
储存温度	-40~+75°C		单芯双绞线0.75mm ² 错误! 未找到引用源。 , 最长10m
副边内阻范围	95~120Ω	隔离耐压	5000Vac
精度	0.5%	线性度	0.5%

Table 7 Technical Parameters of AKH-0.66P26 Current Transformer

Input current	0.5mA~50A	Frequency range	0.02-10 kHz
Output current	0.025~25 mA	Loading resistance	<200Ω
Temperature coefficient	100 ppm/°C	Transient current (1s)	200A
Phase displacement	10'	Installation	Pan head of cross slot 4×10, pedicle screw fixation
Operating	-35~+70°C	Secondary	Single core >0.75mm ² 错误! 未找到引用源。

temperature		wiring	找到引用源。 , Maximum length of 1 meter
Storage temperature	-40~+75°C		Single core twisted pair, 0.75mm ² 错误!未找到引用源。 , Maximum length of 10 meters
Secondary resistance range	95~120Ω	Isolation pressure	5000Vac
Accuracy	0.5%	Linearity	0.5%

5 安装与接线

5 Installation and wiring

5.1 外形与安装开孔尺寸

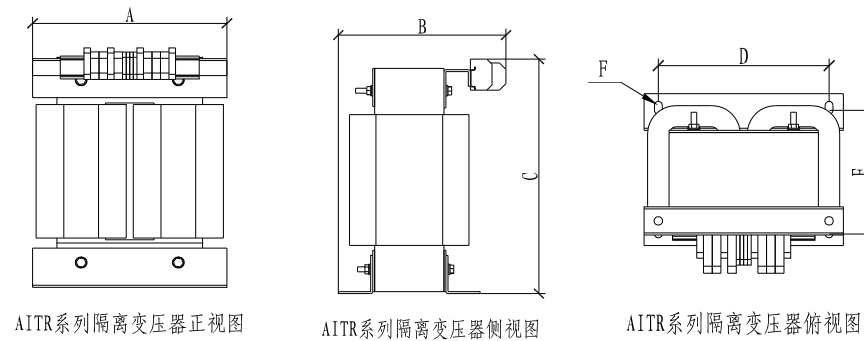
5.1 Shape and mounting hole size

5.1.1 AITR系列医用隔离变压器外形尺寸（单位：mm）

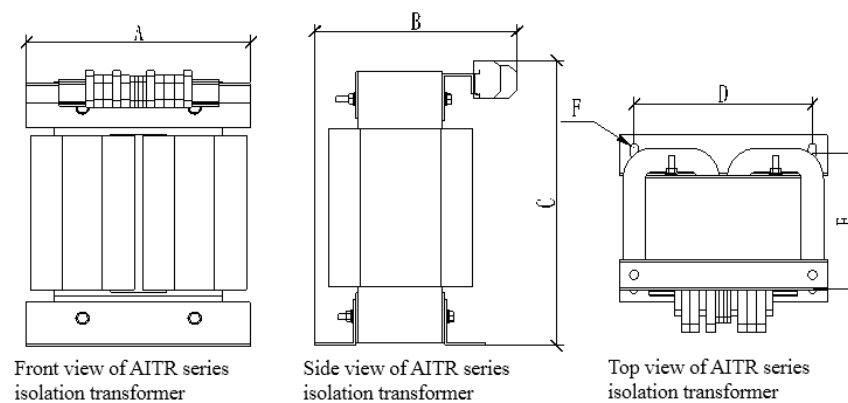
5.1.1 External dimensions of AITR series medical isolation transformer (unit: mm)

AITR系列医用隔离变压器的外形结构及尺寸如下图和表9所示（单位：mm）

Shape structure and size of AITR series medical isolation transformer are shown as below and in Table 9 (unit: mm)



AITR 系列隔离变压器外形尺寸图



External dimensions of AITR series medical isolation transformer

表 9 AITR 系列隔离变压器外形尺寸

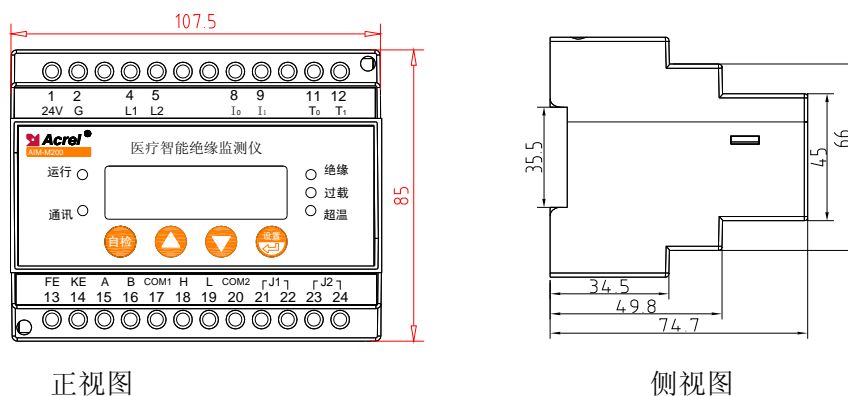
型号	容量 (VA)	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	总重量(kg)
AITR10000	10000	280	275	427	240	190	φ11	92
AITR8000	8000	280	265	427	240	190	φ11	90
AITR6300	6300	280	255	427	240	175	φ11	75
AITR5000	5000	280	255	427	240	175	φ11	73
AITR3150	3150	280	225	427	240	175	φ11	53

Table 9 External Dimensions of AITR Series Medical Isolation Transformer

Type	Capacity (VA)	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	Total weight (kg)
AITR10000	10000	280	275	427	240	190	φ11	92
AITR8000	8000	280	265	427	240	190	φ11	90
AITR6300	6300	280	255	427	240	175	φ11	75
AITR5000	5000	280	255	427	240	175	φ11	73
AITR3150	3150	280	225	427	240	175	φ11	53

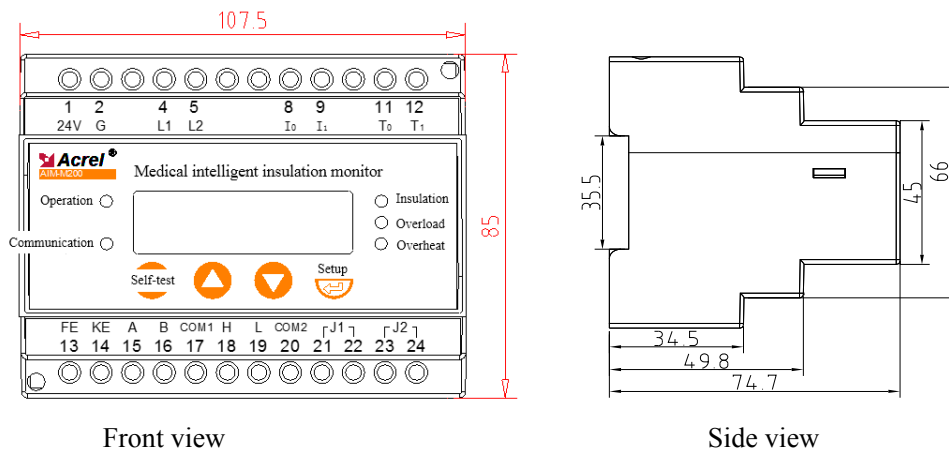
5.1.2 AIM-M200医疗智能绝缘监测仪外形尺寸（单位：mm）

5.1.2 External dimensions of AIM-M200 medical intelligent insulation monitoring instrument (unit: mm)



正视图

侧视图

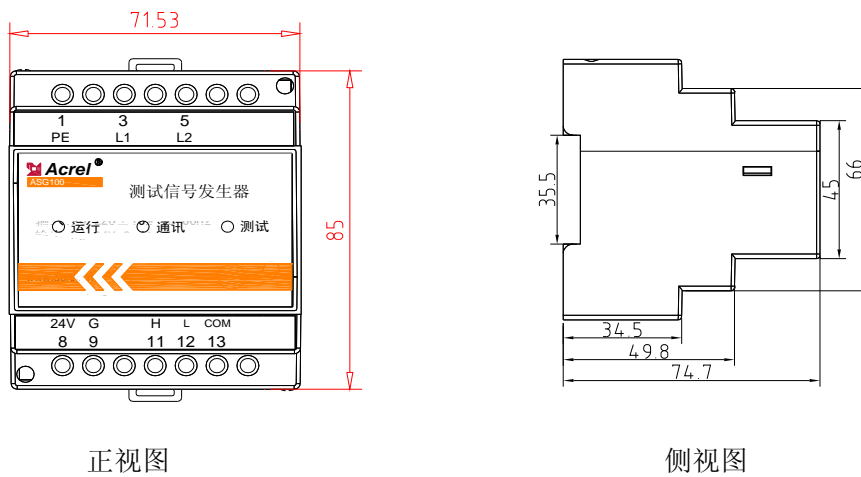


Front view

Side view

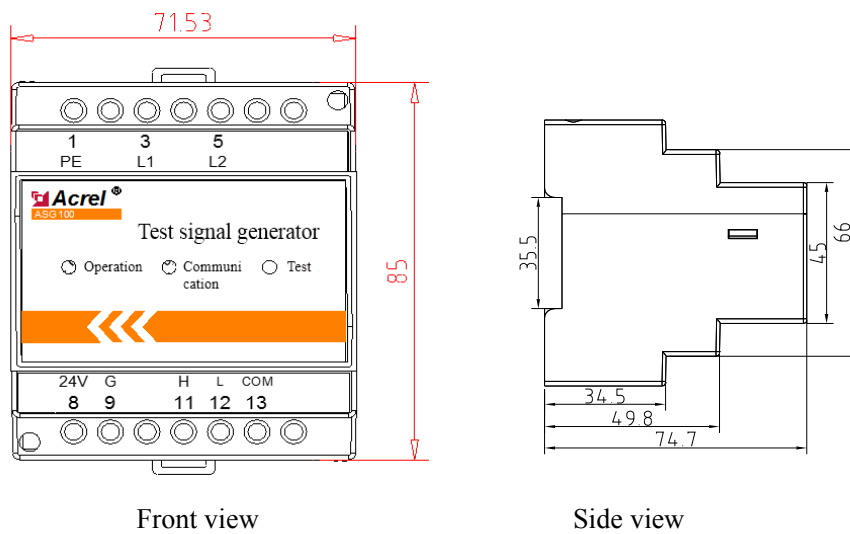
5.1.3 ASG100测试信号发生器外形尺寸（单位：mm）

5.1.3 External dimensions of ASG100 test signal generator (unit: mm)



正视图

侧视图

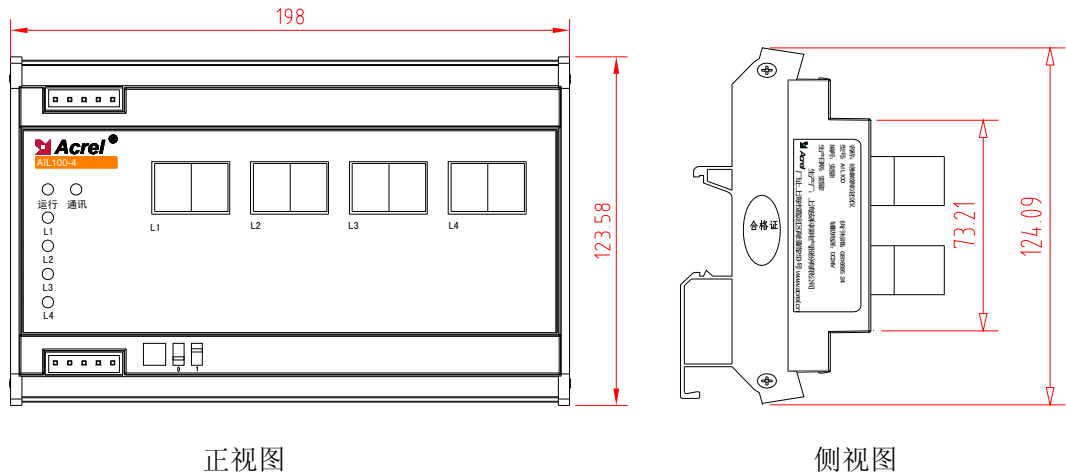


Front view

Side view

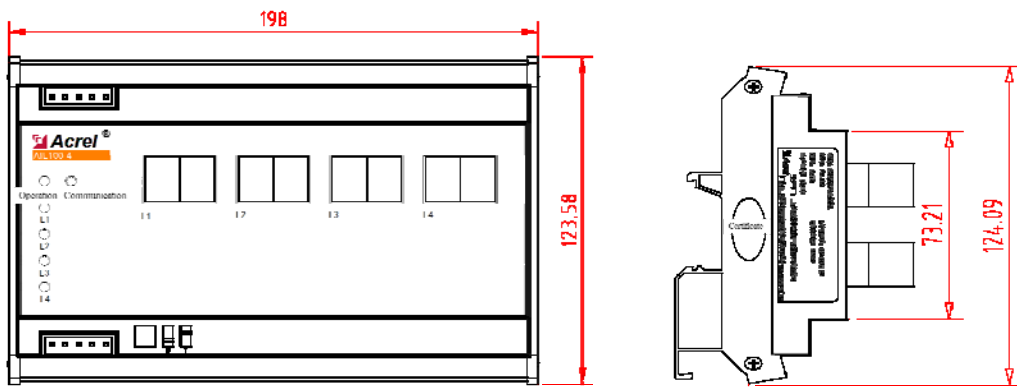
5.1.4 AIL100-4/AIL100-8 绝缘故障定位仪外形尺寸（单位：mm）

5.1.4 External dimensions of AIL100-4/AIL100-8 insulation fault locator (unit: mm)



正视图

侧视图



Front view

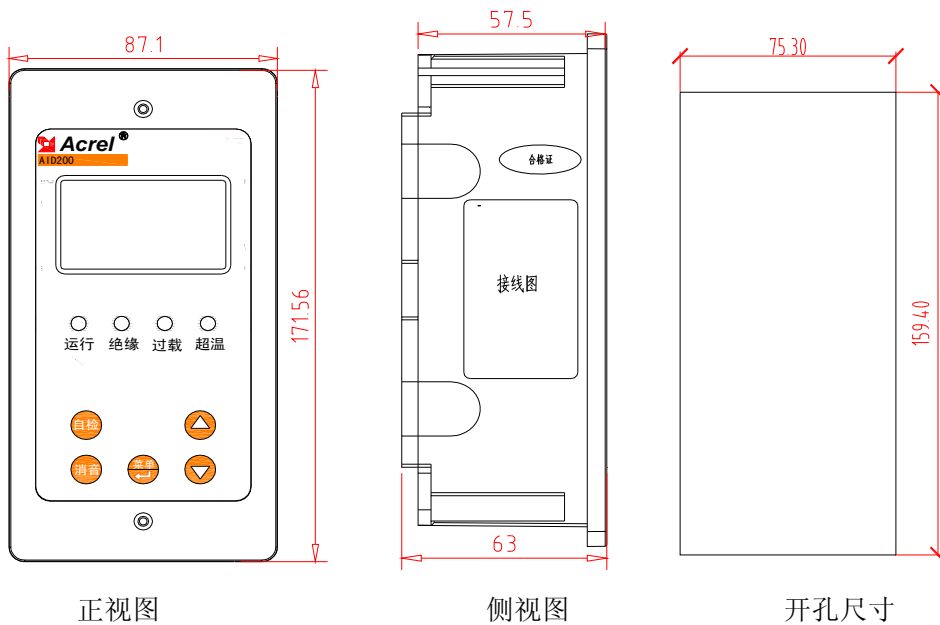
Side view

说明：AIL100-4 和 AIL100-8 两个型号采用相同的产品外壳，故产品外形尺寸完全相同。

Note: AIL100-4 and AIL100-8 these two types take the same product shell, so their external dimensions are exactly the same.

5.1.5 AID200集中报警与显示仪外形尺寸（单位：mm）

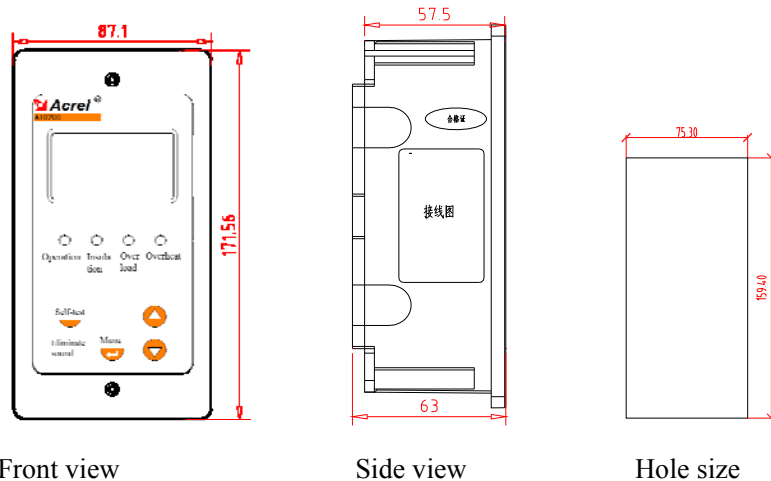
5.1.5 External dimensions of AID200 centralized alarm and display instrument (unit: mm)



正视图

侧视图

开孔尺寸



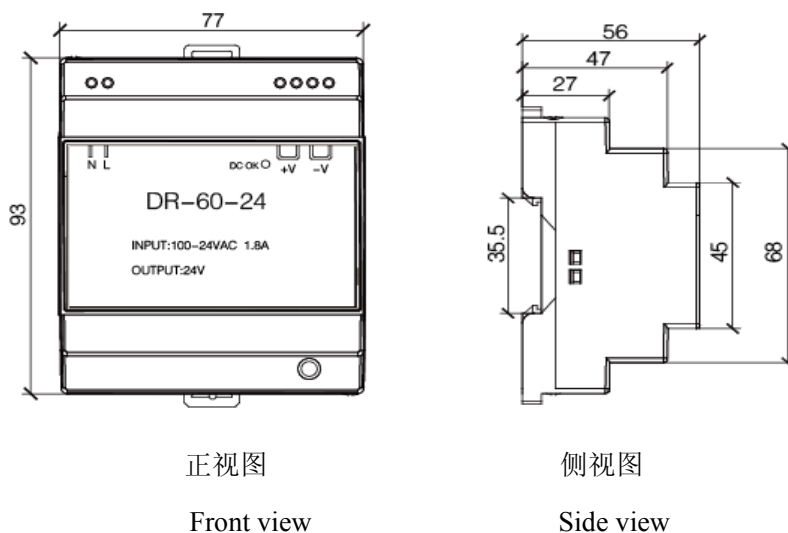
Front view

Side view

Hole size

5.1.6 DR-60-24电源模块外形尺寸（单位：mm）

5.1.6 External dimensions of DR-60-24 power module (unit: mm)



正视图

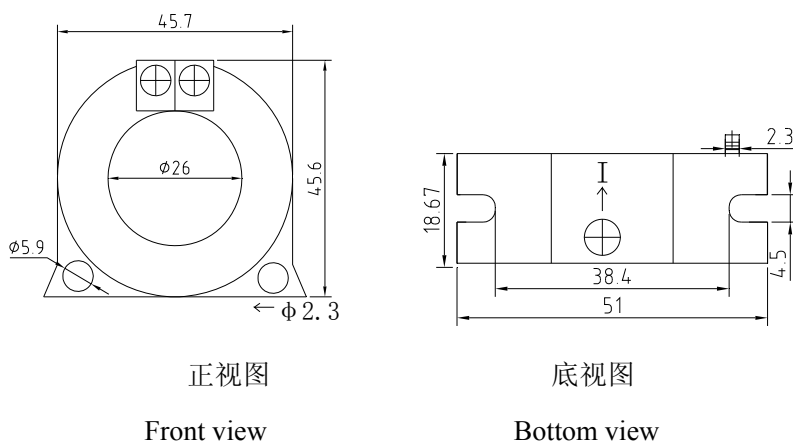
Front view

侧视图

Side view

5.1.7 AKH-0.66P26电流互感器外形尺寸（单位：mm）

5.1.7 External dimensions of AKH-0.66P26 current transformer (unit: mm)



正视图

Front view

底视图

Bottom view

5.2 安装方法

5.2 Installation method

医用IT系统绝缘监测及故障定位装置等七件套产品除了AID200集中报警与显示仪外，最好集中安装在配

电柜（隔离电源柜）里，隔离变压器安装于配电柜底部，用配套的螺栓固定，并安装散热风扇。仪表和断路器则安装于上部面板上。若隔离变压器单独安装，不宜离AIM-M200绝缘监测仪太远。AID200集中报警与显示仪若用于手术室内，可嵌墙安装于手术室内情报面板的旁边，以便手医务人员查看，若用于ICU/CCU等重症监护室里，则应安装手护士站内，供值班护士查看。AID200对外接线包括两根24V电源线和1根2芯屏蔽双绞线的CAN通讯线，这3根线均从隔离电源柜内引来，施工时应注意预留管线。

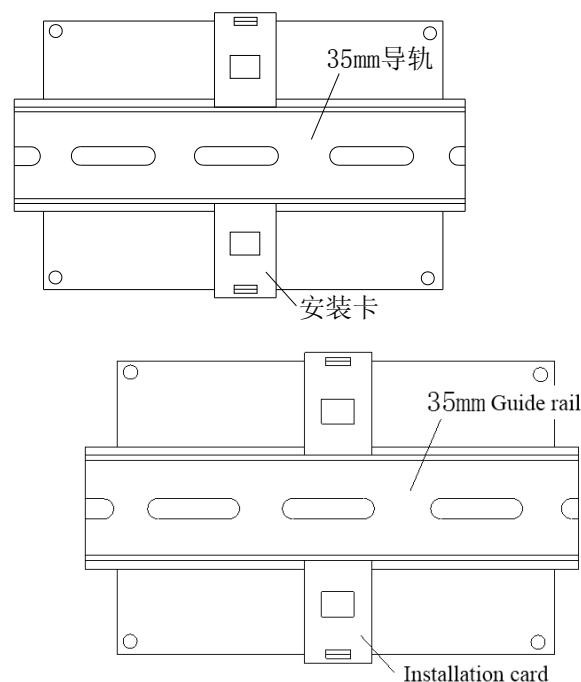
Medical IT system insulation monitoring and fault locating instrument seven pieces of products are preferably installed in the distribution cabinet (isolation power cabinet) except for the AID200 centralized alarm and display instrument. The isolation transformer is installed in the bottom of the distribution cabinet fixed with matching bolts, and the cooling fan should be installed. The instrument and the circuit breaker are installed on the upper panel. If the isolation transformer is installed separately, it is not suitable to put it too far away from the AIM-M200 insulation monitor. If the AID200 centralized alarm and display instrument is used in the operation room, it can be embedded in the wall and installed in the operating room next to the intelligence panel, so that the medical staff can view conveniently. If it is used in ICU/CCU and other intensive care units, it should be installed in the nurses station, so that the duty nurses can view. AID200 external wirings include two 24V power cords and a CAN communication line of two-core shielded twisted pair, which are all drawn from the isolation power cabinet. Pay attention to reserve pipelines during construction.

5.2.1 AIM-M200医疗智能绝缘监测仪安装方式

5.2.1 Installation mode of AIM-M200 medical intelligent insulation monitoring instrument

AIM-M200绝缘监测仪采用导轨的安装方式，固定方式为卡扣式，如下图所示：

AIM-M200 insulation monitor adopts the installation method of the guide rail, and the fixation mode is the clip buckle type, as shown in the following figure:



5.2.2 ASG100测试信号发生器安装方式

5.2.2 Installation mode of ASG100 test signal generator

ASG100采用导轨的安装方式，固定方式为卡扣式，可以和AIM-M200绝缘监测仪并排安装在同一导轨上。

The ASG100 adopts the installation method of the guide rail, and the fixation mode is the clip buckle type, which can be installed on the same guide rail as AIM-M200 insulation monitor.

5.2.3 DR-60-24电源模块安装方式

5.2.3 Installation mode of DR-60-24 power module

DR-60-24电源模块采用导轨的安装方式，卡扣式固定，也可同AIM-M200监测仪并排安装在同一导轨上。

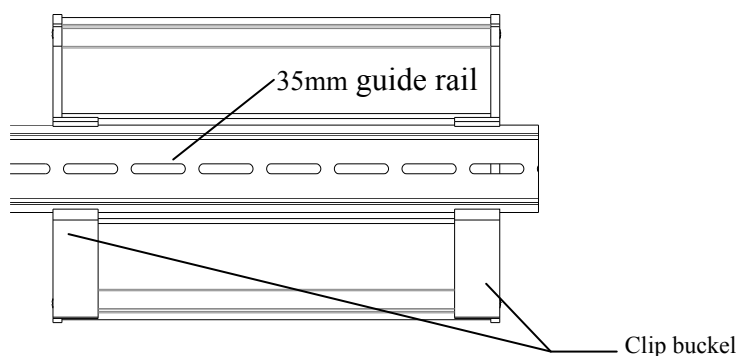
The DR-60-24 power module adopts the installation method of the guide rail, and the fixation mode is the clip buckle type, which can also be installed on the same guide rail as AIM-M200 insulation monitor.

5.2.4 AIL100-4/AIL100-8 绝缘故障定位仪安装方式

5.2.4 Installation mode of AIL100-4/AIL100-8 insulation fault locator

AIL100-4/AIL100-8采用导轨的安装方式，固定方式为卡扣式，如下图所示：

AIL100-4/AIL100-8 adopts the installation method of the guide rail, and the fixation mode is the clip buckle type, as shown in the following figure:



由于IT系统各支路都要穿过AIL100的各互感器后再连接至负载，故为方便布线AIL100在安装时应靠近各支路输出端。

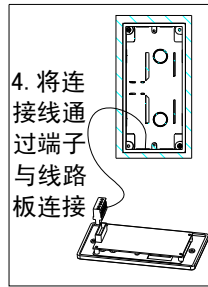
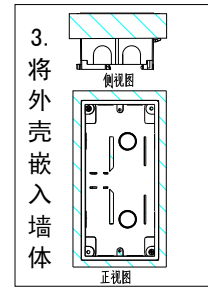
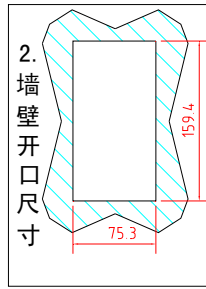
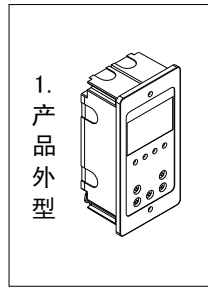
Since each branch of IT system must pass through each transformer of the AIL100 and then connects to the load, the AIL100 should be near the output terminal of each branch during the installation to facilitate the wiring.

5.2.5 AID200集中报警与显示仪安装方式

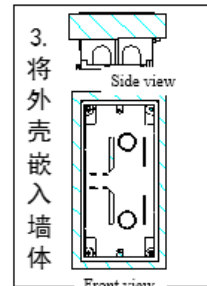
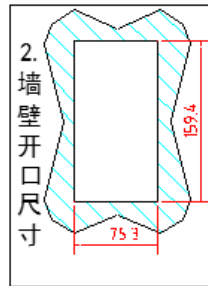
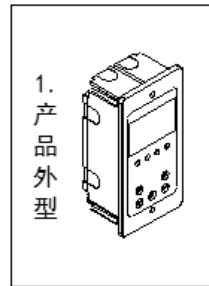
5.2.5 Installation mode of AID200 centralized alarm and display instrument

AID200采用嵌入墙体安装方式，固定方式为锁扣固定，其安装过程如下图所示：

The AID200 adopts the embedded wall installation method, and the fixation mode is the lock catch type, whose installation process is shown in the following figure:



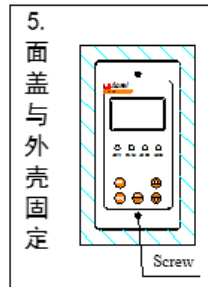
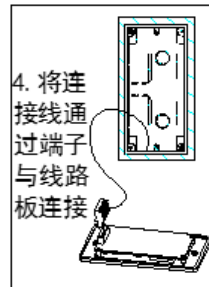
注意：
由于本公司产品在不断地更新，在未得到有关人员确认之前，此图仅供参考。



1. Product shape

2. Wall opening size

3. Embed the shell in the wall



Attention:
Owing to the continuous update of the company products, this picture is for your reference only before the conformation of relevant personnel.

4. Connect the wires to circuit board through terminals

5. Fix the face covering with the shell

在装修时，应先将AID200的外壳嵌入墙体内固定，并将靠近管线的敲落孔敲，使导线（2根电源线+1根两芯的屏蔽双绞线）引入，接到前面盖后，再将面盖用螺钉固定在外壳上。

During the decoration, firstly the AID200 shell should be embedded in the wall to be fixed and be close to the knockouts of the pipeline, so that the wires (two power cords + a two-core shielded twisted pair) can be drawn to the front cover, and then fix the cover on the shell with screws.

5.3 接线方法

5.3 Wiring method

5.3.1 AITR系列医用隔离变压器接线方式

5.3.1 Wiring mode of AITR series medical isolation transformer

在变压器接线端子处，标记为“PM”的为输入端子，其中0、230的两个端子接输入的220V单相交流电。标记为“SEC”的为输出端子，其中0、230的两个端子输出电压为交流220V，外接现场负载。S端子连接到现场的PE母排上（或等电位端子排上）。两个ST端子为温度传感器接口，分别与AIM-M200绝缘监测仪的13、14号端子相连。

The input terminals at the transformer terminal blocks are labeled with “PM”, in which two terminals 0 and 230 are connected to the input 220V single-phase AC. The output terminals are labeled with “SEC”, in which the output voltage of two terminals 0 and 230 is AC 220V and is connected to external field load. The S terminal is connected to the PE bus bar on the spot (or the equipotential terminal line). Two ST terminals are temperature sensor interfaces, which are respectively connected to the No.13 and 14 terminals of AIM-M200 insulation monitoring instrument.

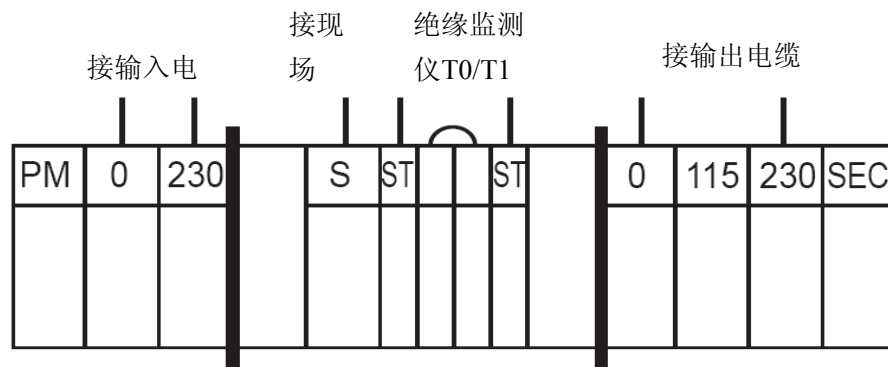


图 2 AITR 系列医用隔离变压器接线端子图

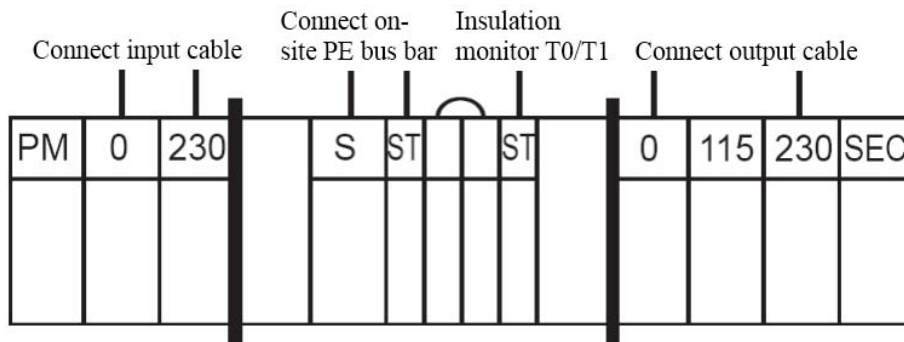


Figure 2 AITR series medical isolation transformer terminal blocks diagram

说明：隔离变压器输入输出端的接线，应根据隔离变压器额定输入输出电流来选择匹配线径的铜线(详见后面5.4部分表格)，S端子的接线地可选用 $2 \times 4 \text{mm}^2$ 黄绿线。两个ST端子的接线可选用 $2 \times 1.5 \text{mm}^2$ 的屏蔽双绞线，且接线不宜过长。

Note: The wirings of input and output terminals of the isolation transformer should select the copper wires matching the line diameter based on the isolation transformer rated input and output current (refer to tables in section 5.4). S terminal wiring can select $2 \times 4 \text{mm}^2$ yellow-green wire. The wiring of two ST terminals can select $2 \times 1.5 \text{mm}^2$ shielded

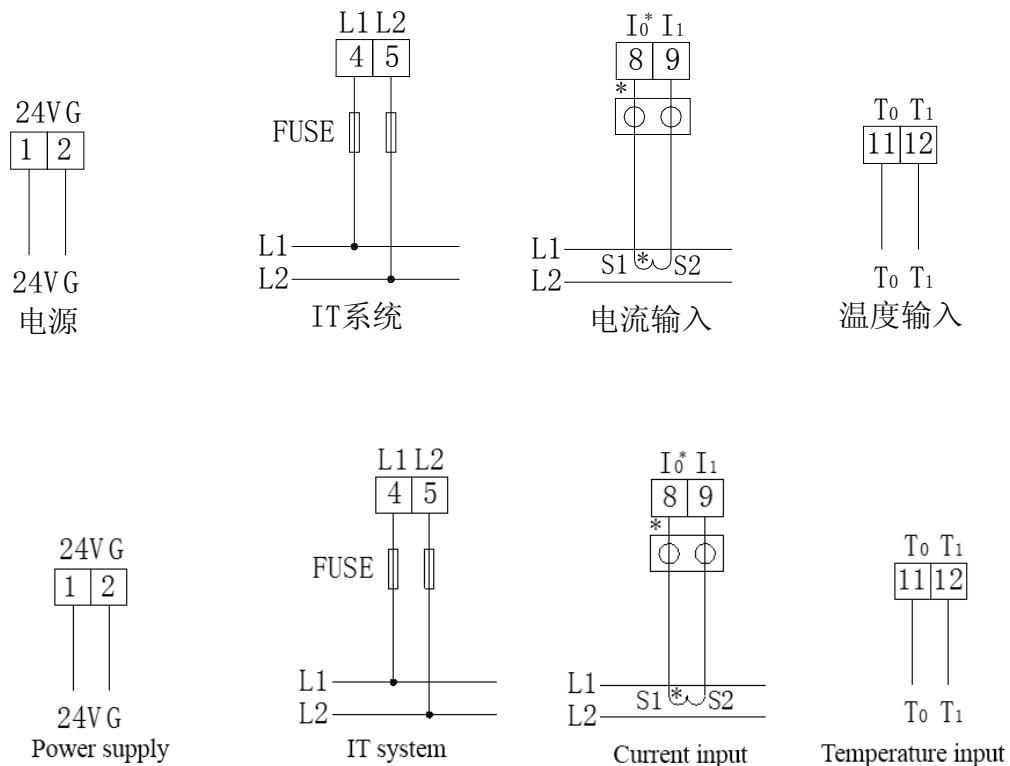
twisted pairs, and the wiring should not be too long.

5.3.2 AIM-M200医疗智能绝缘监测仪接线方式

5.3.2 Wiring mode of

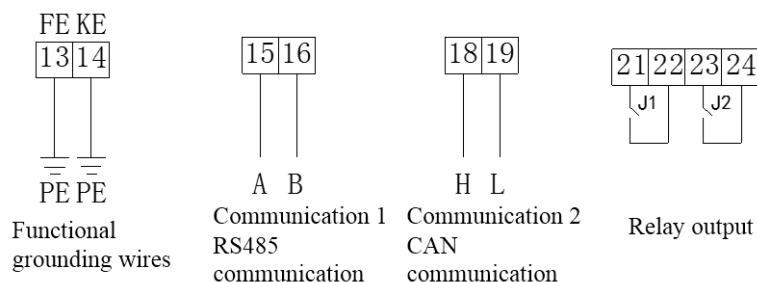
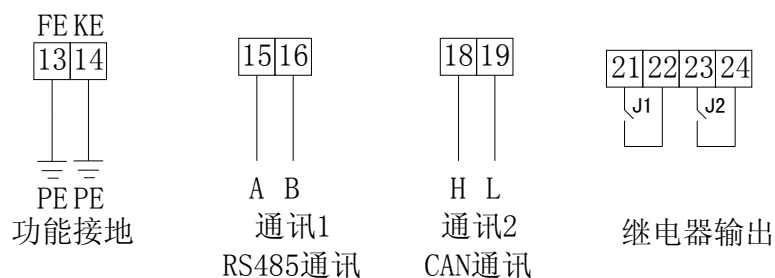
上排端子:24V、G为辅助电源，L1、L2与被监测IT系统连接（可接至隔离变压器的两个输出端）、I0、I1为电流互感器的信号输入、T0、T1为温度传感器的信号输入。

Upper row terminals: 24V, G for the auxiliary power supply, and L1, L2 are connected to the monitored IT system (which can be connected to the two output terminals of isolation transformer). I0, I1 for the current transformer signal input, and T0, T1 as the temperature sensor signal input.




下排端子：KE、FE为功能接地线，应该采用两根相互独立的导线与现场的等电位端子排相连。A、B为与RS485通讯的端子，H、L为与CAN通讯接线端子(用于和ASG100测试信号发生器、AIL100系列绝缘故障定位仪和AID200集中报警与显示仪通讯连接)，J1为超温报警输出（用于控制散热风扇），J2为故障报警继电器输出。

Lower row terminals: KE, FE are the functional grounding wires, which should be connected to the on-site equipotential terminals by two independent wires. A and B for RS485 communication terminals, H and L for CAN communication terminal blocks (which are used for the communication connections with ASG100 test signal generator, AIL100 series insulation fault locator and AID200 centralized alarm and display instrument), J1 for over-temperature alarm output (for control of cooling fan), and J2 for fault alarm relay output.



说明：1)  为用于 CT 二次侧短接的试验端子。

Note: 1)  is used for the test terminals of CT secondary side short connection.

2) 绝缘监测仪 1、2 号端子连接到 24V 电源的接线可采选 $2 \times 1.5\text{mm}^2$ 的铜导线，4、5 号对应的 L1 和 L2 端子，可选用 $2 \times 1.5\text{mm}^2$ 的多股铜线，13、14 号对应的 FE 和 KE 端子，可选用 $2 \times 4\text{mm}^2$ 黄绿线（接地线）。J1、J2 继电器输出为干节点，控制外接负载时需另加电源，如 J1 控制交流 220V 散热风扇时，需外加交流 220V 电源，接线线型根据负载电流确定。

2) The wirings connecting the No.1 and 2 terminals of the insulation monitoring instrument to the 24V power supply can select $2 \times 1.5\text{mm}^2$ copper wires, and the L1 and L2 terminals corresponding to the No.4 and 5 can select $2 \times 1.5\text{mm}^2$ multistrand copper wires, and the FE and KE terminals corresponding to the No.13 and 14 can select $2 \times 4\text{mm}^2$ yellow-green wires (grounding wires). J1, J2 relay output are the dry nodes, which need additional power supply during the control of external load. For example, J1 controls AC 220V cooling fan, then the AC 220V power supply is needed, and the wiring line type should be determined according to the load current.

3) 8、9 号端子对应的互感器信号线、11、12 号端子对应的温度信号线、15、16 号端子对应的 RS485 通讯线，以及 18、19 号端子对应的 CAN 通讯线，可选用 $2 \times 1.5\text{mm}^2$ 屏蔽双绞线，通讯用的 COM 口均不接线。

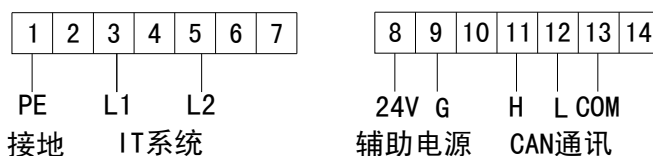
3) The transformer signal wires corresponding to the No.8, 9 terminals, the temperature signal wires corresponding to the No.11, 12 terminals, the RS485 communication wires corresponding to the No.15, 16 terminals, as well as the CAN communication wires corresponding to the No.18, 19 terminals line can select $2 \times 1.5\text{mm}^2$ shielded twisted pairs, and the COM port for communication is not connected.

5.3.3 ASG100测试信号发生器接线方式

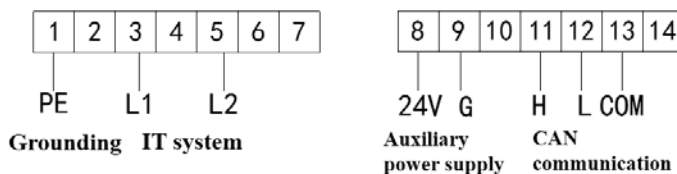
5.3.3 Wiring mode of ASG100 test signal generator

上排端子（1—7）：PE连接到现场的等电位端子排上，L1、L2与被监测的IT系统连接（可并联到隔离变压器输出端）；下排端子（8—14）：24V、G为辅助电源，H、L和COM为CAN通讯接线端子（用于和AIM-M200医疗智能绝缘监测仪、AID200集中报警与显示器、AIL100系列绝缘故障定位仪通讯端子连接）。

Upper row terminals (1-7): PE is connected to the on-site equipotential terminals, and L1, L2 are connected to the monitored IT system (which can be paralleled to the isolation transformer output). Lower-row terminals (8-14): 24V, G for the auxiliary power supply, H, L and COM for the CAN communication terminals (used for the connection with the communication terminals of AIM-M200 medical intelligent insulation monitoring instrument, AID200 centralized alarm and display instrument and AIL100 series insulation fault locator).



说明：相关接线选型可参考上述 AIM-M200 绝缘监测仪选用的线型。通讯的 COM 口对外不接线。



Note: The relevant wiring type selection can refer to the above AIM-M200 insulation monitor selected wire type. The COM port for communication does not connect to the outside.

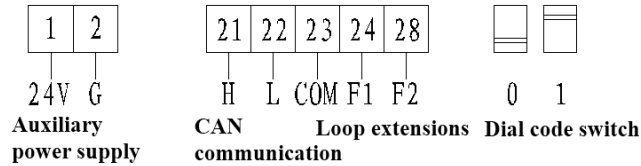
5.3.4 AIL100-4/AIL100-8 绝缘故障定位仪接线方式

5.3.4 Wiring mode of AIL100-4/AIL100-8 insulation fault locator

上排端子（1—2）：24V、G为辅助电源；下排端子（21—23）：H、L为CAN通讯接线端子（用于和医疗智能绝缘监测仪、集中报警与显示器以及测试信号发生器通讯端子连接）。

Upper row terminals (1-2): 24V, G are auxiliary power supply. Lower-row terminals (21-23): H, L are CAN communication terminals (used for communication terminals connection with medical intelligent insulation monitor, centralized alarm and display instrument, and test signal generator).





下排端子（24、28）：F1、F2用作绝缘故障定位仪回路扩展功能。当1套IT系统中所需定位回路超出8回路时，可以同时采用2只（且最多2只）AIL100系列绝缘故障定位仪，此时需将第2个绝缘故障定位仪F1、F2端子线接线短接。短接后，第2只故障定位仪定位的支路数变成9-12路（AIL100-4），或9-16路（AIL100-8）。

Lower-row terminals (24, 28): F1, F2 are used for the loop expansion function of insulation fault locator. When the number of circuits needed to located is beyond 8 in one set of IT system, you can simultaneously use two (and two at most) AIL100 series insulation fault locators, at which time the wirings of the second insulation fault locator F1, F2 terminals should be short connection. After the short connection, the located branch number of the second insulation fault locator becomes 9-12 circuits (AIL100-4), or 9-16 circuits (AIL100-8).

为了保障CAN通讯的正常运行，需要各仪表的CAN接口以手拉的方式连接，同时在通讯总线的首末端各联1只120欧姆的匹配电阻。AIL100系列绝缘故障定位仪可以通过拨码开关将内置的匹配电阻并联到总线上。各仪表的CAN通讯手拉手连接时，可以将AIL100放置于CAN总线的首端或末端，并将2只拨码开关皆拨至1的位置（即上端），即可加入120Ω的匹配电阻，保障通讯畅通。如果AIL100在CAN总线末端，则应将2只拨码开关皆拨至0位置（即下端），以断开匹配电阻。

In order to ensure the normal operation of CAN communication, the CAN interface of each instrument needs to be connected by a hand in hand approach, at the same time, the head and end of the communication bus wire should be connected with a 120Ω matching resistor. The AIL100 series insulation fault locator can connect the built-in matching resistors to the bus wire in parallel through the dial code switch. When the CAN communications of each instrument are connected hand in hand, the AIL100 can be placed on the head or end of the CAN bus wire, and the two dial code switches should be dialed to position 1 (that means the top), thus the 120Ω matching resistors can be added to ensure smooth communication. If the AIL100 is at the end of the CAN bus wire, the two dial code switches should be dialed to the position 0 (that means the bottom) to disconnect the matching resistors.

说明：相关接线选型可参考上述 AIM-M200 绝缘监测仪选用的线型。通讯的 COM 口对外不接线。

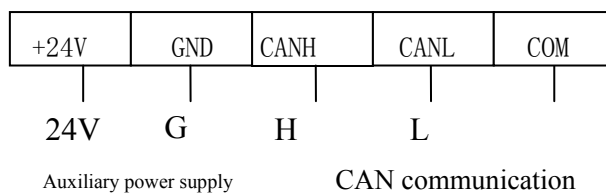
Note: The relevant wiring type selection can refer to the above AIM-M200 insulation monitor selected wire type. The COM port for communication does not connect to the outside.

5.3.5 AID200集中报警与显示仪接线方式

5.3.5 Wiring mode of AID200 centralized alarm and display instrument

+24V、G端子为辅助电源，CANH、CANL与AIM-M200、ASG100和AIL100-4/AIL100-8的H、L连接。

+24V, G terminals are for auxiliary power supply, and CANH, CANL are connected to the H, L terminals of AIM-M200, ASG100 and AIL100-4/AIL100-8.



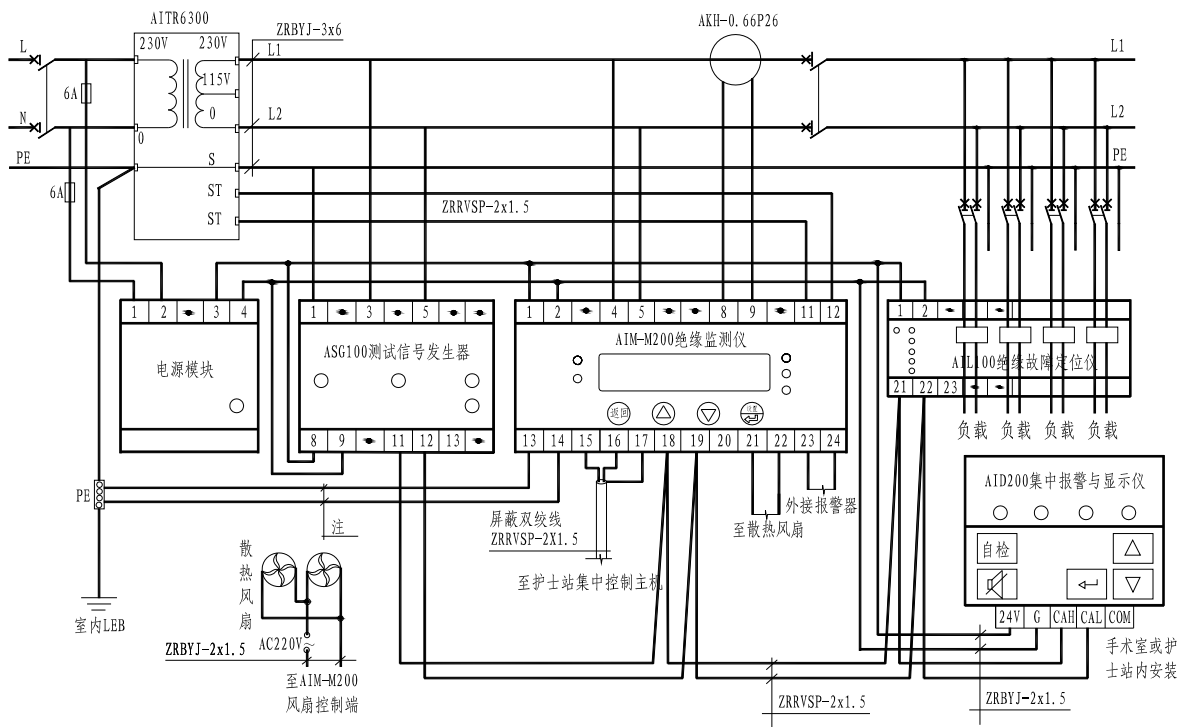
说明：相关接线选型可参考上述 AIM-M200 绝缘监测仪选用的线型。通讯的 COM 口对外不接线。

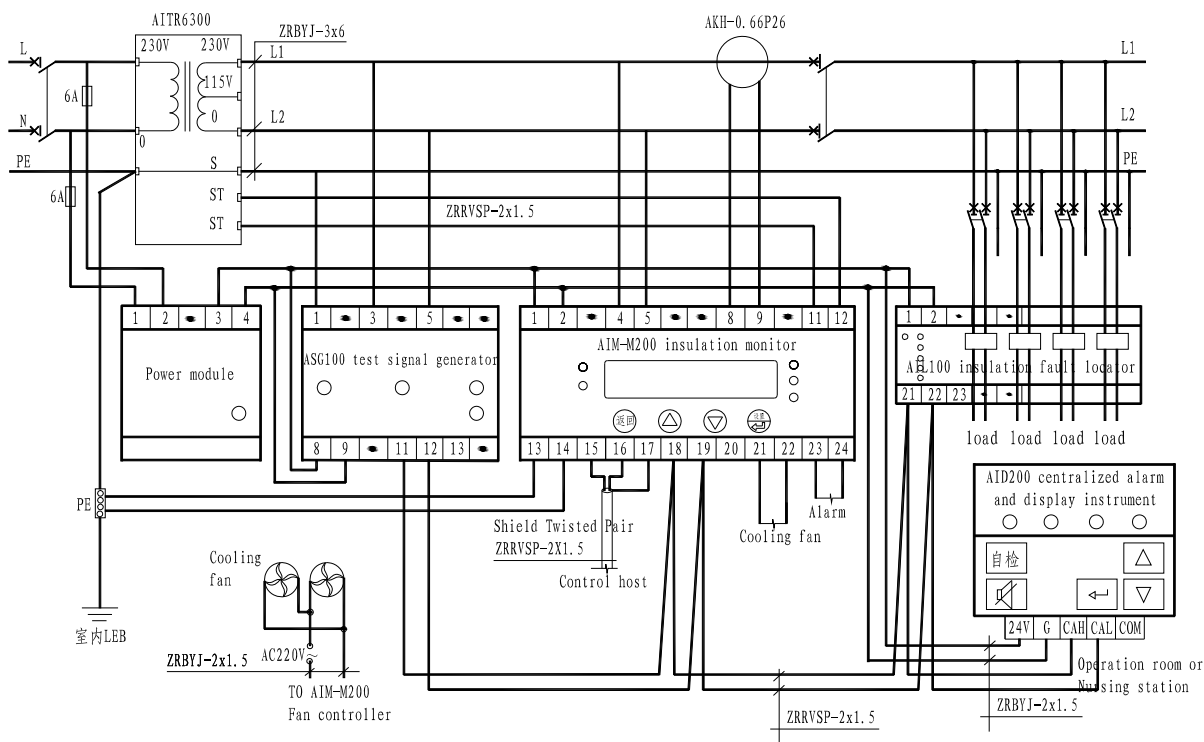
Note: The relevant wiring type selection can refer to the above AIM-M200 insulation monitor selected wire type.

The COM port for communication does not connect to the outside.

5.4 典型接线图

5.4 Typical wiring diagram





说明:

Note:

- 1) 隔离变压器输入输出端的接线线径应该与隔离变压器的额定电流相匹配, 也可以根据下表选型:
- 1) The connection line diameter of the input and output of the isolation transformer should match the rated current of the isolation transformer, or it can be selected according to the following table:

隔离变压器型号	所选线径
AITR3150	3×4mm ²
AITR5000/AITR6300	3×6mm ²
AITR8000/AITR10000	3×10mm ²

Isolation transformer type	Selected line diameter
AITR3150	3×4mm ²
AITR5000/AITR6300	3×6mm ²
AITR8000/AITR10000	3×10mm ²

2) AIM-M200绝缘监测仪(对应端子: 1、2号)、ASG100测试信号发生器(对应端子: 8、9号)、AIL100绝缘故障定位仪(对应端子: 1、2号)和AID200集中报警与显示仪(对应端子: 24V、G)的辅助电源(仪表工作电源)均为直流24V, 由DR-60-24直流电源模块(24V输出端子: 3、4号)统一供电。考虑到开关电源可能对IT系统造成干扰, 直流电源模块输入交流220V(对应端子: 1、2号)由隔离变压器的输入端引入, 并串接6A的熔断器保护。

2) The auxiliary power supply (instrument working power) for AIM-M200 insulation monitoring instrument (corresponding terminals: No.1, 2), ASG100 test signal generator (corresponding terminals: No.8, 9), AIL100

insulation fault locator (corresponding terminals: No.1, 2), and AID200 centralized alarm and display (corresponding terminals: 24V, G) are all DC 24V, which is supplied by the DR-60-24 DC power module (24V output terminals: No.3, 4). Considering that the switching power supply may interfere with the IT system, the AC 220V (corresponding terminals: No.1, 2) input by DC power module is introduced by the input terminal of the isolation transformer and is connected with the fuse protector of 6 A.

3) AIM-M200绝缘监测仪的21、22号端子继电器输出控制为干节点，用于控制风扇时需另加风扇的电源。当多台变压器集中安装于1台隔离电源柜内时，多台风扇应该连接成由多台绝缘监测仪并行控制的方式，即每1台绝缘监测仪都能启停所有的风扇。

3) The relay output control of the No.21 and 22 terminals of the AIM-M200 insulation monitor is a dry node, which needs an additional fan power supply when used for the fan control. When multiple transformers are centrally installed in one isolation power cabinet, multiple fans should be connected in a parallel mode controlled by multiple insulation monitors, that is, every one insulation monitor can start or stop all fans.

4) AKH-0.66P26只需穿过隔离变压器二次侧输出L1、L2两根线中的任何一根即可，但不能同时穿两根线。其输出用 $2\times 1.5\text{mm}^2$ 的线接至AIM-M200的8号、9号端子上，且不允许接地。

4) AKH-0.66P26 only needs to pass through one of the L1, L2 two wires of the isolation transformer secondary side output terminal, but can not pass through the two wires simultaneously. The output is connected with the $2\times 1.5\text{mm}^2$ wire to the No.8, 9 terminals of AIM-M200, which is not allowed for grounding.

5) 为了可靠监测隔离电源系统对地绝缘，AIM-M200绝缘监测仪的4、5号端子应用 $2\times 1.5\text{mm}^2$ 的多芯铜线可靠连接到IT系统上（可并联连到隔离变压器的输出端），13、14号端子应用两根独立的 4mm^2 的黄绿接地线分别连接到现场的等电位端子排（或隔离电源柜内的接地端子排）上。

5) In order to reliably monitor the grounding insulation of the isolation power system, the No.4, 5 terminals of AIM-M200 insulation monitor should be reliably connected to IT system (which can be connected in parallel to the output terminal of the isolation transformer) with $2\times 1.5\text{mm}^2$ multicore copper wires, and the No.13, 14 terminals should be respectively connected to the on-site equipotential terminals (or the grounding terminals in the isolation power cabinet) with two independent 4mm^2 yellow-green grounding wires.

6) 为可靠实现故障定位，ASG100测试信号发生器的3、5号端子应用 $2\times 1.5\text{mm}^2$ 的多芯铜线可靠连接到IT系统上（可并联连到隔离变压器的输出端），1号端子应用1根 4mm^2 的黄绿接地线连接至现场的等电位端子排（或隔离电源柜内的接地端子排）上。隔离电源系统各支路负载配电的两根线（不包括PE线）应一起按由上到下的方式穿过AIL100系列故障定位仪上各互感器后，再接至末端负载上。

6) In order to realize reliable fault location, the No.3, 5 terminals of ASG100 test signal generator should be reliably connected to the IT system (which can be connected to the output terminal of the isolation transformer) with $2\times 1.5\text{mm}^2$ multi-core copper wires, and the No.1 terminal should be connected to the on-site equipotential terminals (or the grounding terminals in the isolation power cabinet) with one 4mm^2 yellow-green grounding wire. The two load distribution wires (excluding PE wire) of each branch of the isolation power system should together pass through each transformer of the AIL100 series fault locator in a top-down method, and then are connected to the terminal load.

7) AIM-M200 (18、19号端子)、ASG100 (11、12号端子)、AIL100 (21、22号端子)和AID200 (CAH、CAL端子) 之的CAN通讯线连接可选用 $2\times 1.5\text{mm}^2$ 的屏蔽双绞线, 接线时应采用手拉手的方式(即上一只表的通讯线接至本表的通讯端子后, 再从本表的端子上引出来, 接至下表的通讯端子上), CAN总线的首末端的两通讯端子间应各并接1只匹配电阻, 推荐并随货附带的电阻阻值为 120Ω 。AIM-M200的13、14号端子为RS485通讯端子, 用于与上位机的通讯, 如果没有上位机, 则不接线。

7) The CAN communication connections between AIM-M200 (No.18, 19 terminals), ASG100 (No.11, 12 terminals), AIL100 (No.21, 22 terminals) and AID200 (CAH, CAL terminals) can use $2\times 1.5\text{mm}^2$ shielded twisted pair, of which the wiring should be in a hand-in-hand mode (that is, the communication wire of the previous meter is connected to the communication terminal of this meter, and then is drawn from the terminal of this meter to be connected to the communication terminal of next meter). The two communication terminals at head and end of the CAN bus wire should be connected with one matching resistor respectively, and the recommended and attached resistance value is 120Ω . The No.13, 14 terminals of AIM-M200 are RS485 communication terminals, used for the communication with the upper computer, if no upper computer, no wiring is needed.

5.5 注意事项

5.5 Considerations

(1)医用IT系统绝缘监测和故障定位七件套产品, 除了AID200外, 应集中安装于隔离电源柜中。若现场空间有限无法采用隔离电源柜时, 隔离变压器可单独安装, 但不宜离绝缘监测仪和现场负载过远。

(1) Medical IT system insulation monitoring and fault locating seven pieces of products should be centrally installed in the isolation power cabinet except for AID200. If the field space is too limited to apply the isolation power cabinet, the isolation transformer can be installed separately, but should not be too far away from the insulation monitor and the field load.

(2)安装接线时严格应按接线图进行接线, 接线最好用针式套接头压接后, 再插入仪表相应端子并将螺钉拧紧, 避免因接触不良而导致仪表工作不正常。

(2) The installation of wiring should strictly follow the wiring diagrams, which should preferably use the pressure connection with the needle-type fittings, and then insert into the corresponding terminal of the instrument and tighten the screws to avoid the abnormal work conditions of instrument caused by loose connection.

(3)仪表和变压器的接地线均应与现场的等电位端子排可靠连接。当采用隔离电源柜时, 应先连接到隔离电源柜内的接地端子排上, 再统一连接至现场的等电位端子排。

(3) The grounding wire of the instrument and the transformer shall be reliably connected with the equipotential terminals in the field. When applying the isolation power cabinet, it should be connected to the grounding terminals in the isolation power supply cabinet, and then to the equipotential terminals in the field.

(4)AIM-M200医疗智能绝缘监测仪电流输入要采用配套的AKH-0.66P26型电流互感器, 接线时建议接线用U型压头压接后, 再接到CT的接线端子上, 不要直接用裸线头连接, 以保证连接可靠, 也便于拆装。去除该接线前, 必须先切断CT一次回路或者短接二次回路。

(4) The current input of AIM-M200 medical intelligent insulation monitoring instrument should use a matching AKH-0.66P26 type current transformer. It is recommended to use pressure connection with U-type indenters during wiring operation, and then connect to the CT terminal. Do not directly use the bare head connection, for the considerations of reliable connection and easy disassembly. Before removing the wiring, the CT primary circuits must be cut off or the secondary circuits must be short connection.

(5)特别提醒:

(5) Special reminder:

任何隔离变压器在启动时均会产生冲击电流，过大的冲击电流可能会造成变压器一次侧的断路器断开或闭合困难，因此对于采用医用隔离变压器及绝缘监测产品组成的医疗 IT 系统，在选择隔离变压器进线回路的断路器时，应按国标要求选用只带短路保护，不带过负荷保护的断路器。若选用带过载保护的断路器，应选用符合国标 GB14048.2-2008 的 C、D 脱扣曲线的断路器，且断路器的额定电流根据隔离变压器的容量按如下对应关系确定：10kVA-63A；8kVA-50A；6.3kVA-40A；5kVA-40A；3.15kVA-20A。

Any isolation transformer will have an impact current when it starts up, and too large impact current may cause the circuit breaker at primary side of the transformer difficult to disconnect or shut down. Therefore, for medical IT systems composed of medical isolation transformers and insulation monitoring products, in the selection of inlet circuit breaker of the isolation transformer, it is recommended to choose the circuit breakers only with short circuit protection but without overload protection according to GB requirements. If choosing the circuit breaker with overload protection, the circuit breaker should conform to the C and D tripping curves of GB14048.2-2008, and the rated current of the circuit breaker should be determined according to the capacity of the isolation transformer as follows: 10kVA-63A, 8kVA-50A, 6.3kVA-40A, 5kVA-40A, 3.15kVA-20A.

若未按上述要求选择断路器，发生断路器闭合困难或运行过程中断开而引起的医疗事故，本公司不承担任何责任。

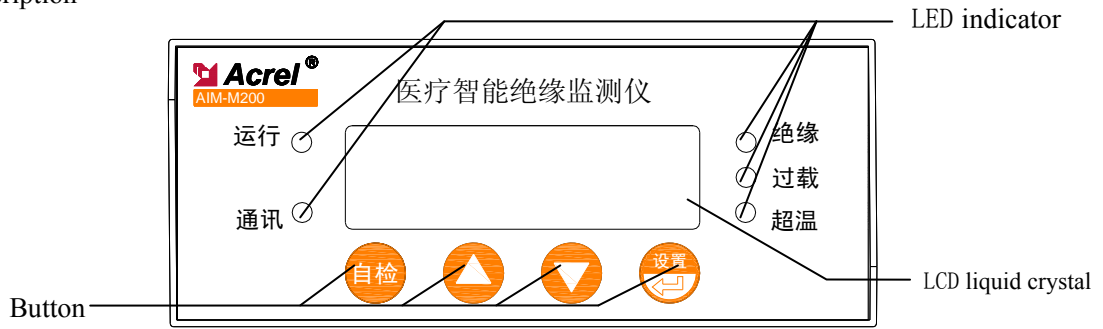
If the circuit breaker selection is not in accordance with the above requirements, the company shall not be liable for any medical malpractice caused by the closure difficulty of the circuit breaker or the disconnection of the circuit breaker during operation.

6 编程与使用

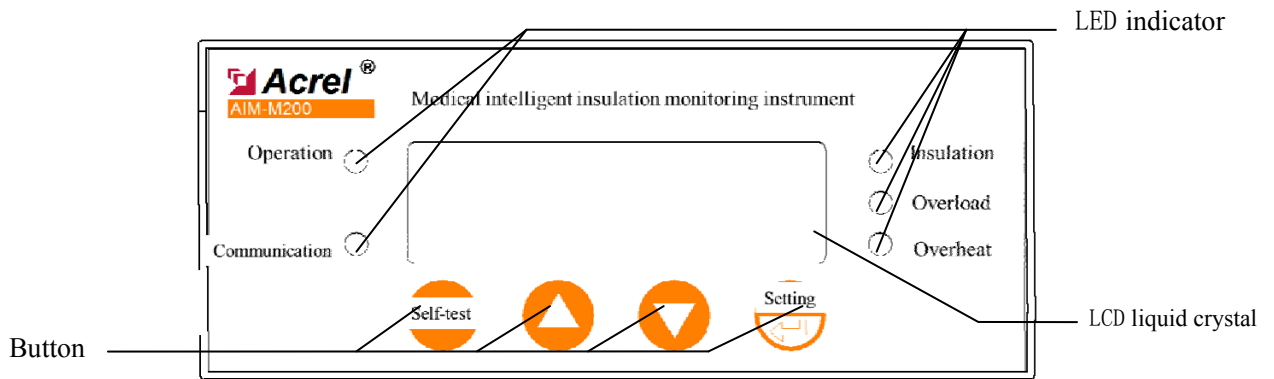
6 Programming and application

6.1 面板说明

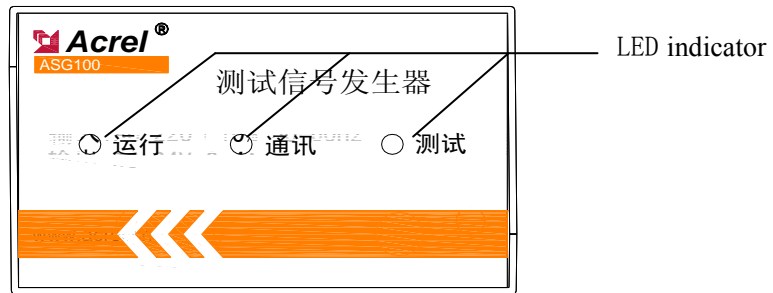
6.1 Panel description



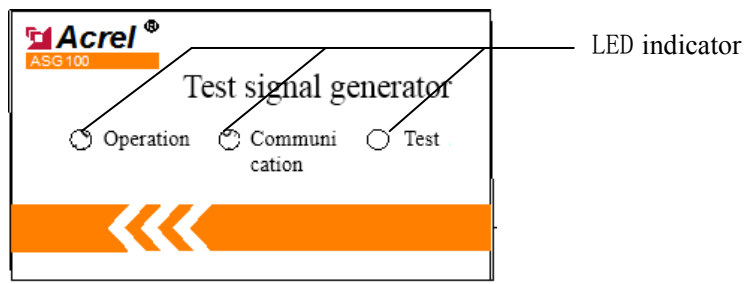
AIM-M200医疗智能绝缘监测仪面板



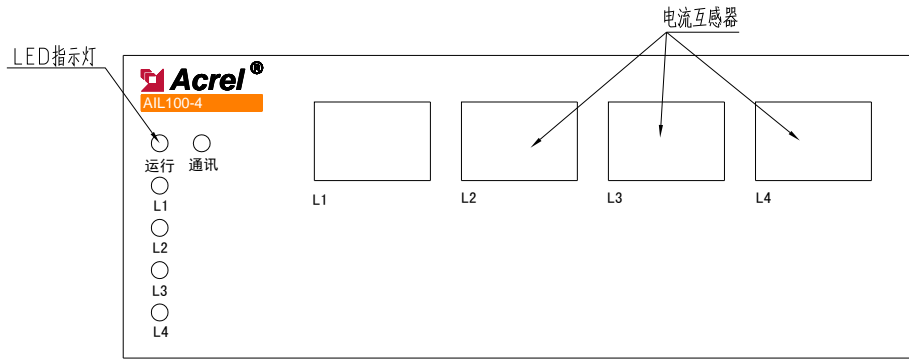
AIM-M200 medical intelligent insulation monitoring instrument panel



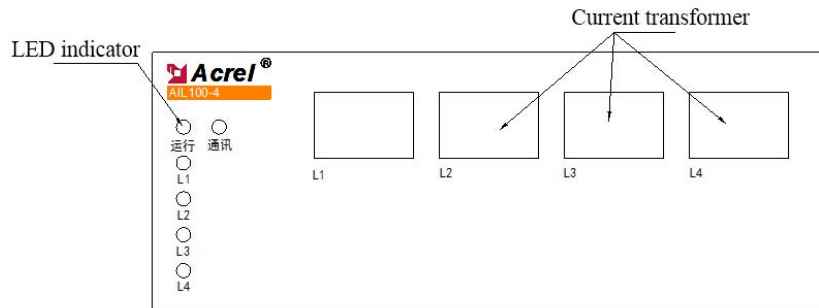
ASG100测试信号发生器面板



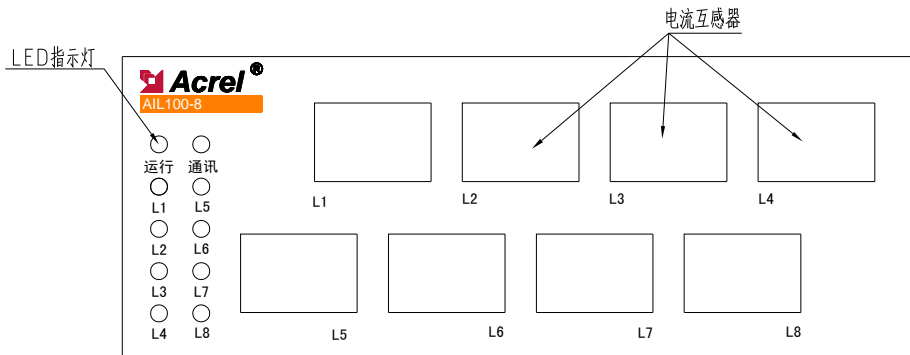
ASG100 test signal generator panel



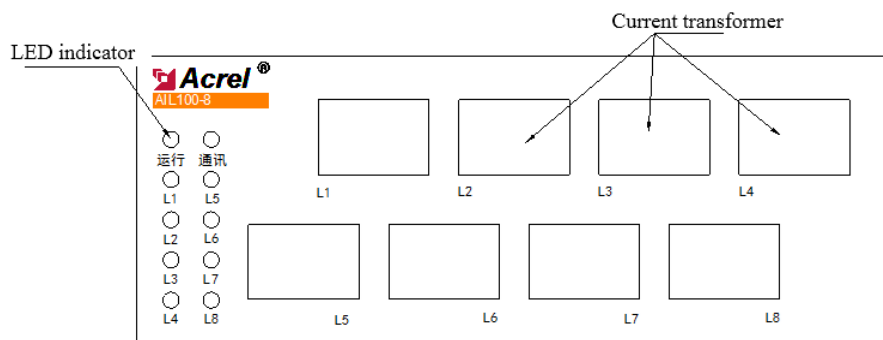
AIL100-4绝缘故障定位仪面板



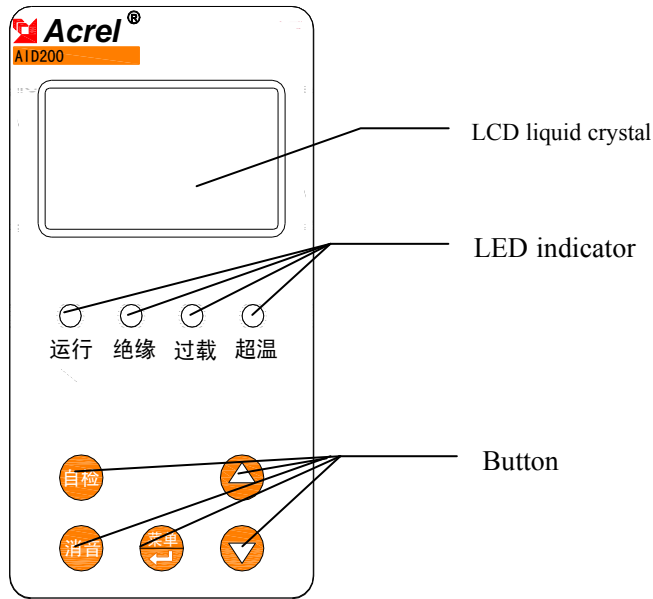
AIL100-4 insulation fault locator panel



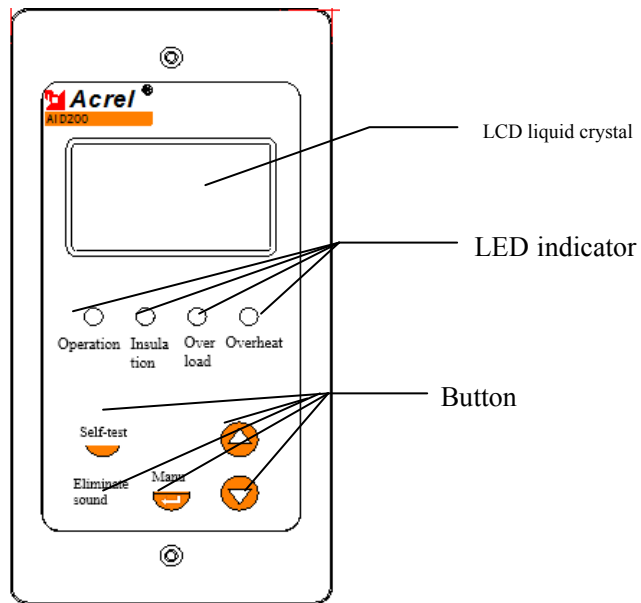
AIL100-8绝缘故障定位仪面板



AIL100-8 insulation fault locator panel



AID200集中报警与显示仪面板



AID200 centralized alarm and display instrument panel

6.2 LED 指示说明

6.2 LED indicator instructions

6.2.1 AIM-M200医疗智能绝缘监测仪LED指示说明

6.2.1 LED indicator instructions of AIM-M200 medical intelligent insulation monitoring instrument

指示灯状态	说明
“运行”状态	装置正常运行时，指示灯闪烁，闪烁频率大约为一秒一次
“通讯”状态	指示装置通讯状况，有数据通讯时，指示灯闪烁
“绝缘”状态	当绝缘电阻超过报警值，或LL断线/FK断线时，指示灯闪烁报警
“过载”状态	当负荷电流超过变压器总负荷电流时，指示灯闪烁报警

“超温”状态	当检测的变压器温度超过报警值，或温度传感器接线断线时，指示灯闪烁报警
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Indicator status	Instructions
“operation” status	When the instrument operation is normal, the indicator light flashes, with the flashing frequency of about one time per second.
“communication” status	Indicate the status of device communication, when there is data communication, the indicator light flashes.
“insulation” status	When the insulation resistance exceeds the alarm value, or when the LL/FK is disconnected, the indicator light flashes to alarm.
“overload” status	When load current exceeds the total load current of transformer, the indicator light flashes to alarm.
“overheat” status	When testing transformer temperature exceeds the alarm value, or when the temperature sensor wiring is disconnected, the indicator light flashes to alarm.

6.2.2 ASG100测试信号发生器LED指示说明

6.2.2 LED indicator instructions of ASG100 test signal generator

指示灯状态	说明
“运行”状态	装置正常运行时，指示灯闪烁，闪烁频率大约为一秒一次
“通讯”状态	指示装置通讯状况，有数据通讯时，指示灯闪烁
“测试”状态	当指示灯为绿色时，表明系统正常运行；为红色时，表明装置出现L1、L2断线故障；出现红绿交替闪烁时，表明装置正在产生故障定位信号

Indicator status	Instructions
“operation” status	When the instrument operation is normal, the indicator light flashes, with the flashing frequency of about one time per second.
“communication” status	Indicate the status of device communication, when there is data communication, the indicator light flashes.
“test” status	When the indicator light is green, it indicates normal operation of the system; When red, it indicates the instrument has L1, L2 disconnection fault; When the red and green flash alternately, it indicates the instrument is generating fault location signals.

6.2.3 AIL100-4/AIL100-8 绝缘故障定位仪LED指示说明

6.2.3 LED indicator instructions of AIL100-4/AIL100-8 insulation fault locator

指示灯状态	说明
“运行”状态	装置正常运行时，指示灯闪烁，闪烁频率大约为一秒一次
“通讯”状态	指示装置通讯状况，有数据通讯时，指示灯闪烁
“L1-L8”状态	指示绝缘故障所在的回路

Indicator status	Instructions
“operation” status	When the instrument operation is normal, the indicator light flashes, with the flashing frequency of about one time per second.
“communication” status	Indicate the status of device communication, when there is data communication, the indicator light flashes.
“L1-L8” status	Indicate the circuits of the insulation fault

6.2.4 AID200集中报警与显示仪LED指示说明

6.2.4 LED indicator instructions of AID200 centralized alarm and display instrument

指示灯状态	说明
“运行”状态	装置正常运行时，指示灯闪烁，闪烁频率大约为一秒一次
“绝缘”状态	当绝缘电阻超过报警值时，指示灯闪烁报警
“过载”状态	当负荷电流超过变压器总负荷电流时，指示灯闪烁报警
“超温”状态	当检测的变压器温度超过报警值时，指示灯闪烁报警

Indicator status	Instructions
“operation” status	When the instrument operation is normal, the indicator light flashes, with the flashing frequency of about one time per second.
“insulation” status	When the insulation resistance exceeds the alarm value, the indicator light flashes to alarm.
“overload” status	When load current exceeds the total load current of transformer, the indicator light flashes to alarm.
“overheat” status	When testing transformer temperature exceeds the alarm value, the indicator light

	flashes to alarm.
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6.3 按键功能说明

6.3 Button function descriptions

6.3.1 AIM-M200医疗智能绝缘监测仪按键功能说明

6.3.1 Button function descriptions of AIM-M200 medical intelligent insulation monitoring instrument

AIM-M200共有四个按键，分别为“设置回车”共用键、“▲”上键、“▼”下键、“自检”键。

AIM-M200 has four buttons in total, namely the “Setting and Enter” shared button, “▲” Up button, “▼”Down button, and “Self-test” button.

按键	按键功能
设置回车合用键	非编程模式下，按该键进入编程模式； 编程模式下，当回车确认键使用。
▲上键、▼下键	非编程模式下，用于查看故障记录、版本信号或向AID200注册地址。编程模式下，用于数值、位数的增减或更改保护动作状态。
自检键	运行状态下，用于启动仪表自检功能。其它状态下用于返回功能

Buttons	Button function
Setting and Enter shared button	In non-programming mode, press this button to enter the programming mode; In programming mode, used as the Enter button.
▲ Up button, ▼ Down button	In non-programming mode, used to view the fault records, the version signal, or to register addresses to AID200. In programming mode, used to increase or decrease the values and digits, or to change the protection action status
Self-test button.	In operation state, used to start the self-test function of instrument. In other state, used as return function.

6.3.2 AID200集中报警与显示仪功能按键说明

6.3.2 Button function descriptions of AID200 centralized alarm and display instrument

接集中报警与显示仪共有五个按键，分别为“消音键”、“菜单回车”共用键、“▲”上键、“▼”下键、“自检”键。

The centralized alarm and display instrument has five buttons in total, namely the “Eliminate sound button”, “Menu and Enter” shared button, “▲” Up button, “▼”Down button, and “Self-test” button.

按键	按键功能
消声键	当有报警产生时，按下此键可以消去报警声音。
▲上键、▼下键	编程模式下，用于个位数的增加或减少。
自检键	非编程模式下，用于启动仪表自检功能。其它状态下用于返回功能

菜单回车合用键	非编程模式下，按该键进入编程模式； 编程模式下，当回车确认键使用。
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按键	按键功能
Eliminate sound button	When there is alarm, press this button to eliminate the alarm sound.
▲ Up button, ▼ Down button	In programming mode, used to increase or decrease the single-digit.
Self-test button	In non-programming mode, used to start the self-test function of instrument. In other state, used as return function.
Menu and Enter shared button	In non-programming mode, press this button to enter the programming mode; In programming mode, used as the Enter button.

6.4 按键操作说明

6.4 Button operation descriptions

6.4.1 AIM-M200医疗智能绝缘监测仪在RUN模式下按键操作

6.4.1 Button operation of AIM-M200 medical intelligent insulation monitoring instrument in RUN mode

(1)进入RUN运行模式。开机默认进入的模式就是RUN模式，LCD在显示软件版本号后，如果不进行其它按键操作，则系统进入RUN模式并运行。主界面显示绝缘电阻值、温度值、电流值、负荷率和当前系统时间。

(1) Enter RUN the operation mode. The mode of the default entry is RUN mode, after the LCD displays the software version number, if you do not do other button operation, the system goes into RUN mode and starts operation. The main interface shows the insulation resistance value, temperature value, current value, load rate and current system time.

(2)查看报警记录。在主界面下，按“下键”则可进入“故障记录查询”界面，按“回车”键确认，便可通过“下键”或“上键”翻页，依次查询各条故障记录情况。第一条记录为最新的记录，第十条记录为最旧的记录。

(2) View the alarm records. In the main interface, press "Down button" to enter the "Fault records query" interface, and press "enter" button to confirm, then you can turn the pages through "Down button" or "Up button" to query each fault record in sequence. The first record is the most recent record, and the tenth is the oldest record.

(3)查看软件版本信息。在主界面，连续两次按“下键”，便可看到软件的版本信息。

(3) View software version information. In the main interface, you can see the version information of the software by pressing the "Down button" twice consecutively.

(4)向AID200注册地址（CAN通讯地址）。当AIM-M200与AID200共同使用时，如果AIM-M200上电时没有成功向AID200注册地址，则需要手动注册。在主界面下，连续三次按“下键”，进入向AID200注册地址界面，按回车键便可实现地址注册，注册完后自动返回主界面。如果注册成功，则CAN通讯指示灯开始闪烁，表示通讯正常。

(4) Register address (CAN communication address) to AID200. When AIM-M200 and AID200 are used together, if AIM-M200 does not successfully register address to AID200, the manual registration is required. In the main interface, press the "Down button" three times consecutively, entering into the AID200 address registration interface, and press Enter button to achieve address registration. After the registration, it will automatically return to the main interface. If the registration is successful, the CAN communication indicator light starts flashing, indicating that communication is normal.

(5)仪表自检。在主界面下，按下“自检”键，监测仪将启动自检程序，模拟过载故障、绝缘故障和超温故障。以检测仪表对主要故障的检测和判断功能是否正常。如果监测仪能检测出上述三种故障，则表明仪表功能正常。

(5) Instrument self-test. In the main interface, press the "Self-test" button, then the monitor will start the Self-test program, simulating the overload fault, insulation fault and over-temperature fault to test whether the detection and judgment function of the instrument to the main faults is normal. If the monitor can detect the above three kinds of faults, it indicates that the instrument function is normal.

6.4.2 AIM-M200医疗绝缘监测仪在编程模式下按键操作

6.4.2 Button operation of AIM-M200 medical intelligent insulation monitoring instrument in programming mode

(1)进入编程模式

(1) Enter the programming mode

在正常运行情况下，按“设置”键，进入编程模式的密码输入页面。通过“上键”或“下键”改变密码大小，输入正确密码后，按“回车”键，便可进入编程模式。

Under normal operation conditions, press the "Setting" button to enter into the code input page of the programming mode. Change the password size by pressing "Up button" or "Down button", and press "Enter" button after entering the correct password to enter the programming mode.

(2)退出编程模式

(2) Exit programming mode

在编程模式下，按“自检”键，进入退出保存确认菜单，通过“上键”或“下键”选择选择[是]或[否]，再按“回车”键，便可退出编程模块并返回主界面。如果在退出前选择[是]，则退出时保存对参数的设置；如果选择了[否]，则对参数的设置在退出前不会被保存。

In programming mode, press the "Self-test" button, entering the menu of exiting, saving and confirmation, and select [Yes] or [No] by pressing "Up button" or "Down button", then press "Enter" button to exit the programming module and return to the main interface. If you select [Yes] before exiting, the settings for the parameter will be saved when you exit; and if [No] is selected, the settings for the parameter will not be saved until you exit.

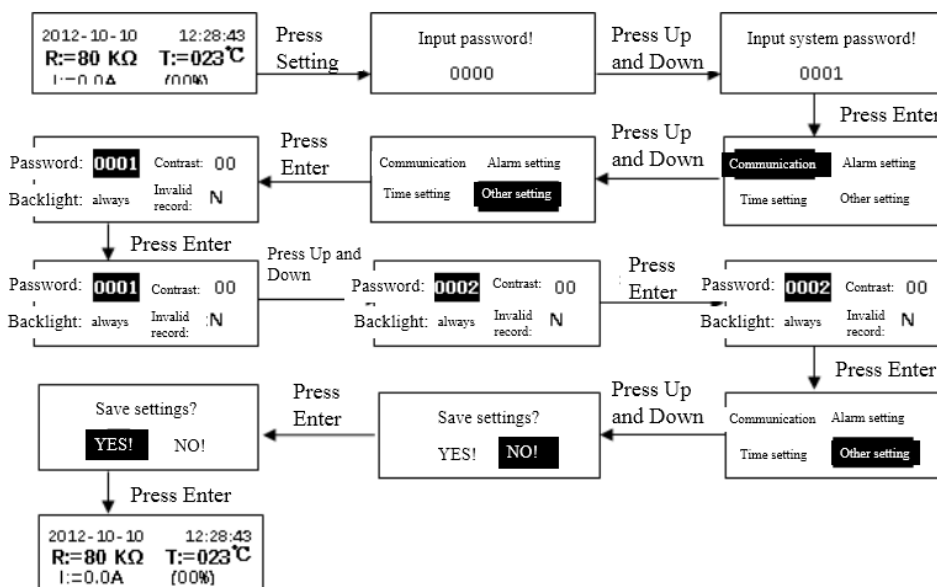
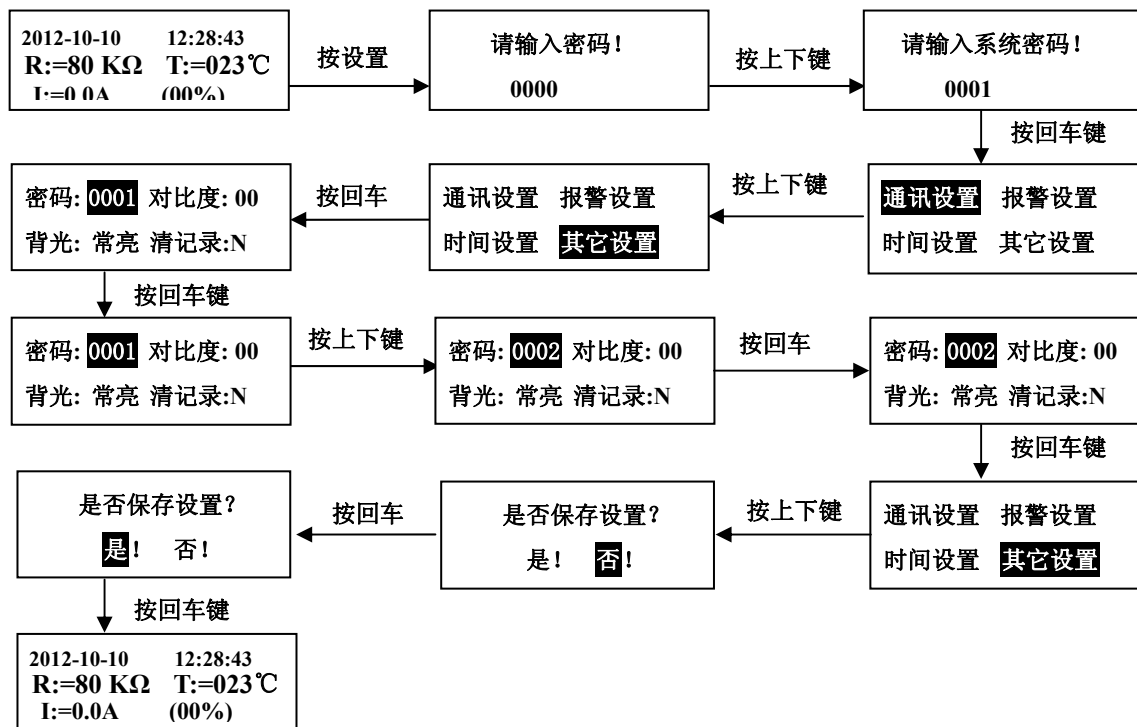
(3)系统密码设置

(3) System password setting

在编程模式下，通过“上键”或“下键”选择[其它设置]，按“回车”键进入其它设置项，再通过“上键”或“下键”使密码数字部分反白显示，按“回车”键确认修改，此时便可以通过“上键”或“下键”改变密码数值大小，修改

完后，再次按“回车”键确认，然后按“自检”键保存并退出编程模式。操作示例如下：

In programming mode, select [Other Settings] by "Up button" or "Down button", and press "Enter" button to enter other settings item, then make the password number part reverse video by "Up button" or "Down button", and press "Enter" button to confirm the modification. At this time you can change the password value by "Up button" or "Down button", and press "Enter" button to confirm after modification, then press "Self-test" button to save and exit programming mode. Examples of operations are as follows:



(3) 报警参数设置

(3) Alarm parameter setting

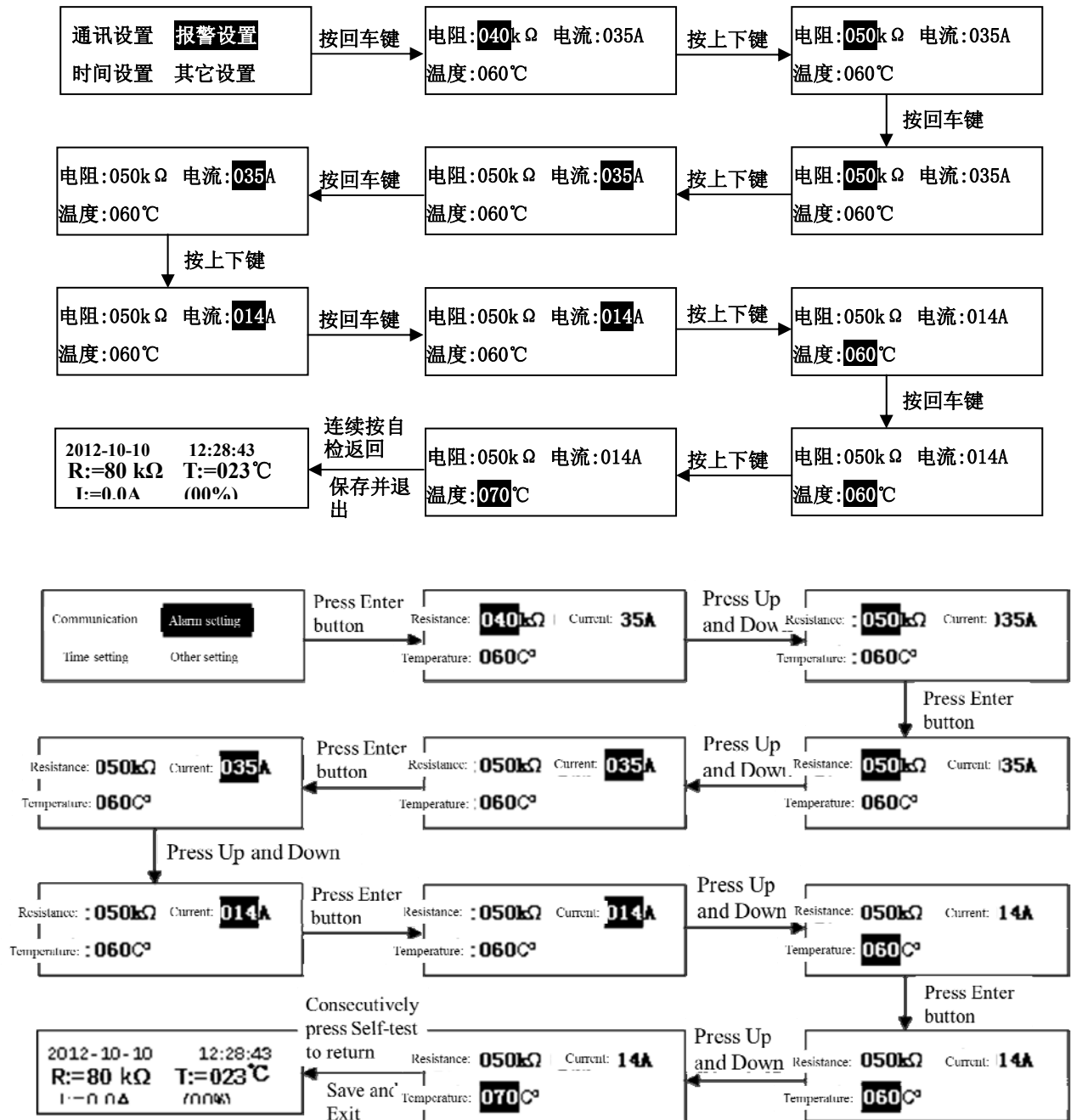
报警参数是对系统绝缘预警值、负载电流预警值和变压器温度预警值的大小进行设置，和“系统密码设置”设置步骤类似。下面只对绝缘预警值、电流预警值和温度预警值的设置进行编程示例。

The alarm parameter means to set the system insulation early warning value, the load current early warning value

and the transformer temperature early warning value, which are similar to the setting procedure of "System password setting". The following are examples of programming for insulation early warning value, current early warning value, and temperature early warning value.

将绝缘预警值设为50kΩ，电流预警值设为14A和温度预警值设为70℃。操作步骤如下：

The insulation early warning value is set to 50kΩ, and the current early warning value is set to 14A and the temperature early warning value is set to 70℃. The procedure is as follows:



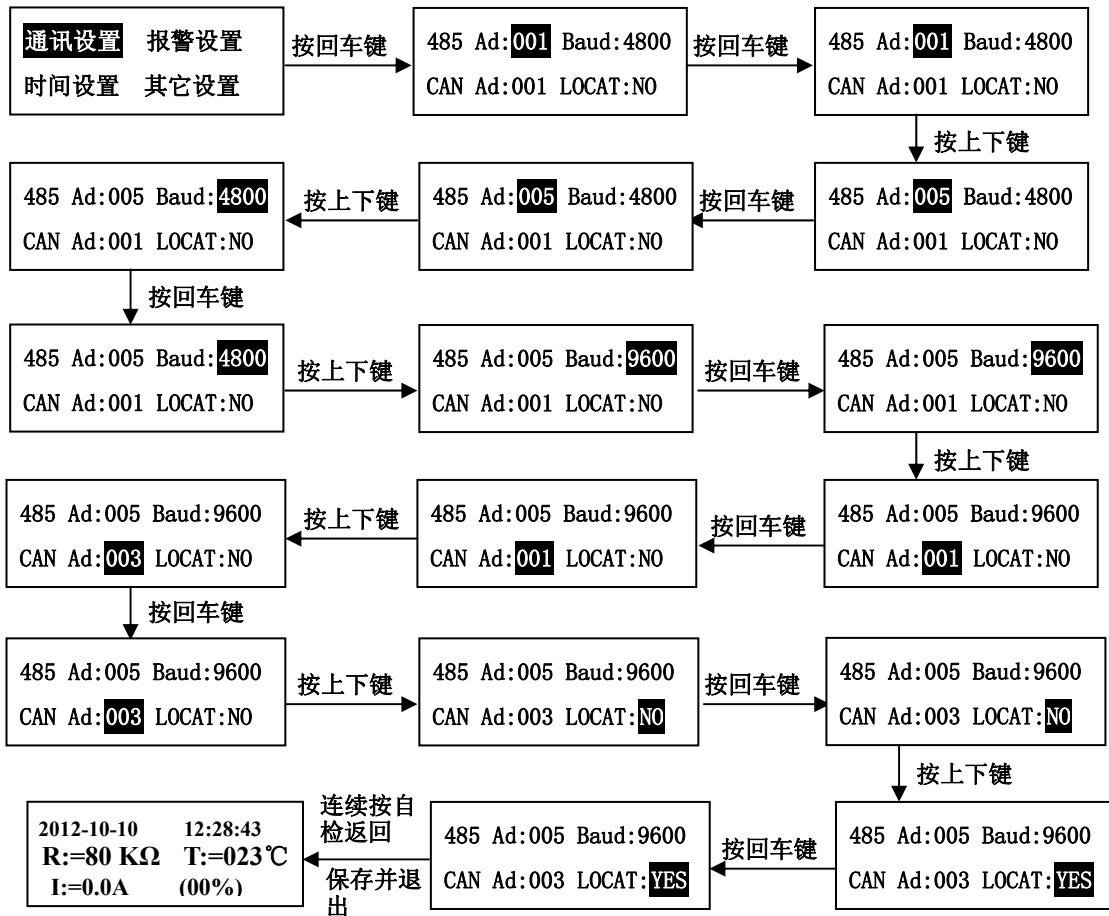
(4) 通讯设置

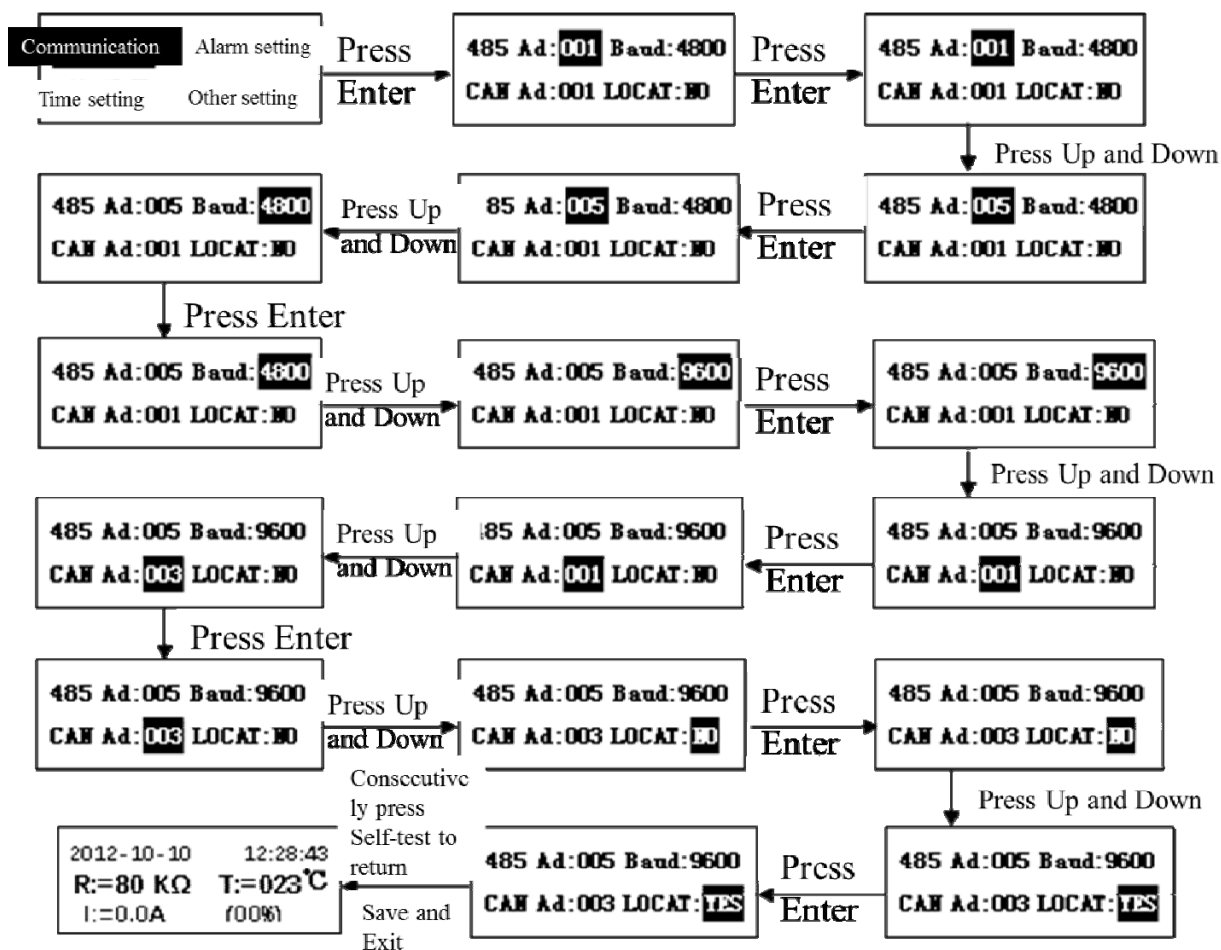
(4) Communication settings

通讯设置包括RS485通讯设置和CAN通讯设置，RS485通讯设置包括设置通讯地址和通讯波特率，CAN通讯设置可以设置通讯地址，还可以设置仪表是否配套使用故障定位仪。现将RS485通讯地址设置为005，主

BAUD设置为9600bps。CAN通讯地址设为003，有故障定位仪。编程示例如下：

Communication settings include RS485 communication settings and CAN communication settings. The RS485 Communication settings include settings of the communication address and communication baud rate, and CAN communication settings mean to set the communication address, which can also set whether the instrument is supporting the use of fault locator. The RS485 communication address is set to 005, and the primary baud is set to 9600bps. The CAN communication address is set to 003, with a fault locator. Examples of programming are as follows:





(5) 其它参数设置。

(5) Other parameter settings.

其它参数的设置包括对比度设置、背光时间设置和清故障记录，其设置方法和系统密码设置方法类似，在此不再赘述。

The settings for other parameters include contrast settings, backlight time settings, and clearing fault records, which are similar to the setting methods of system password settings. Here is no more descriptions.

6.4.3 AID200集中报警与显示仪按键操作

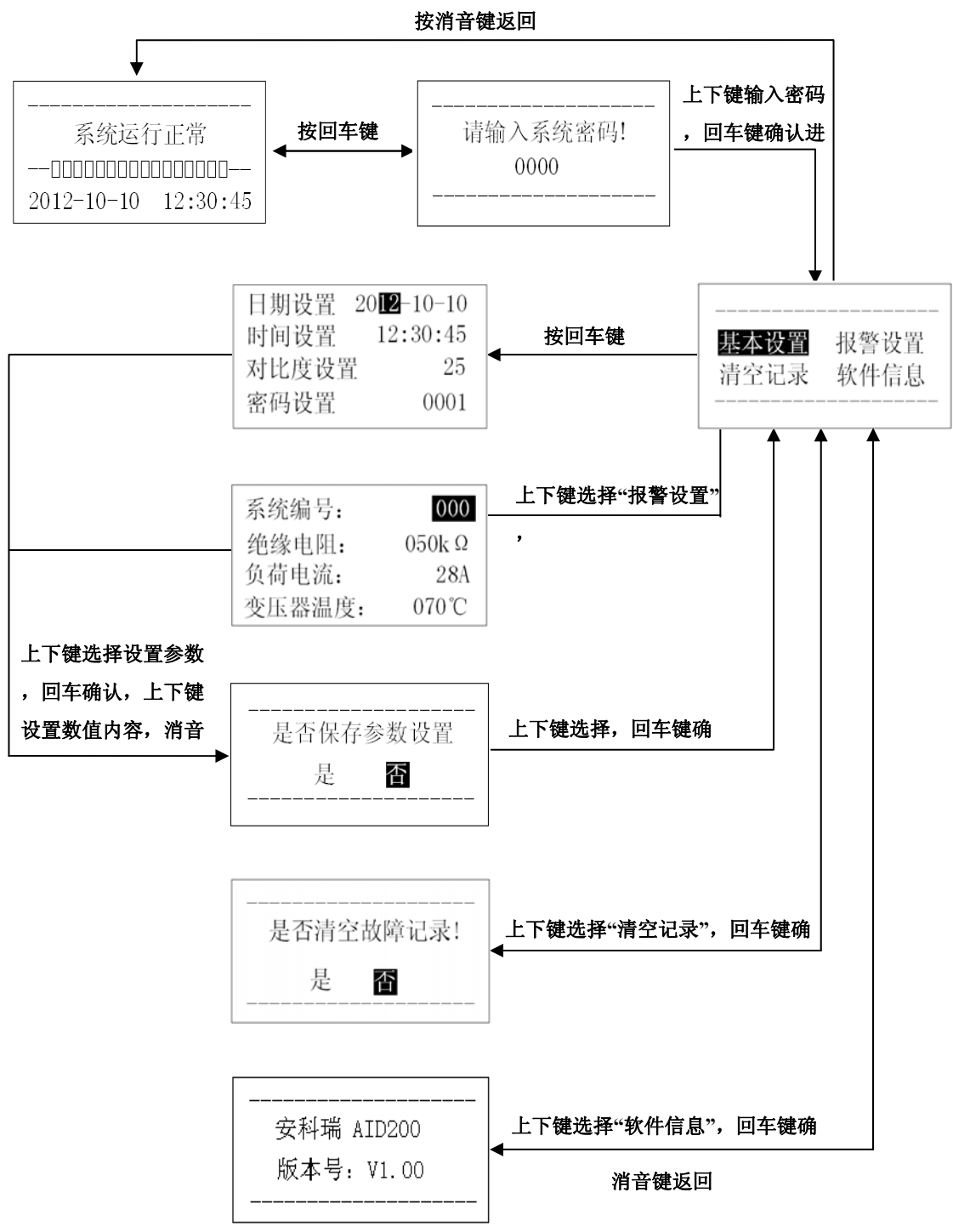
6.4.3 Button operation of AID200 centralized alarm and display instrument

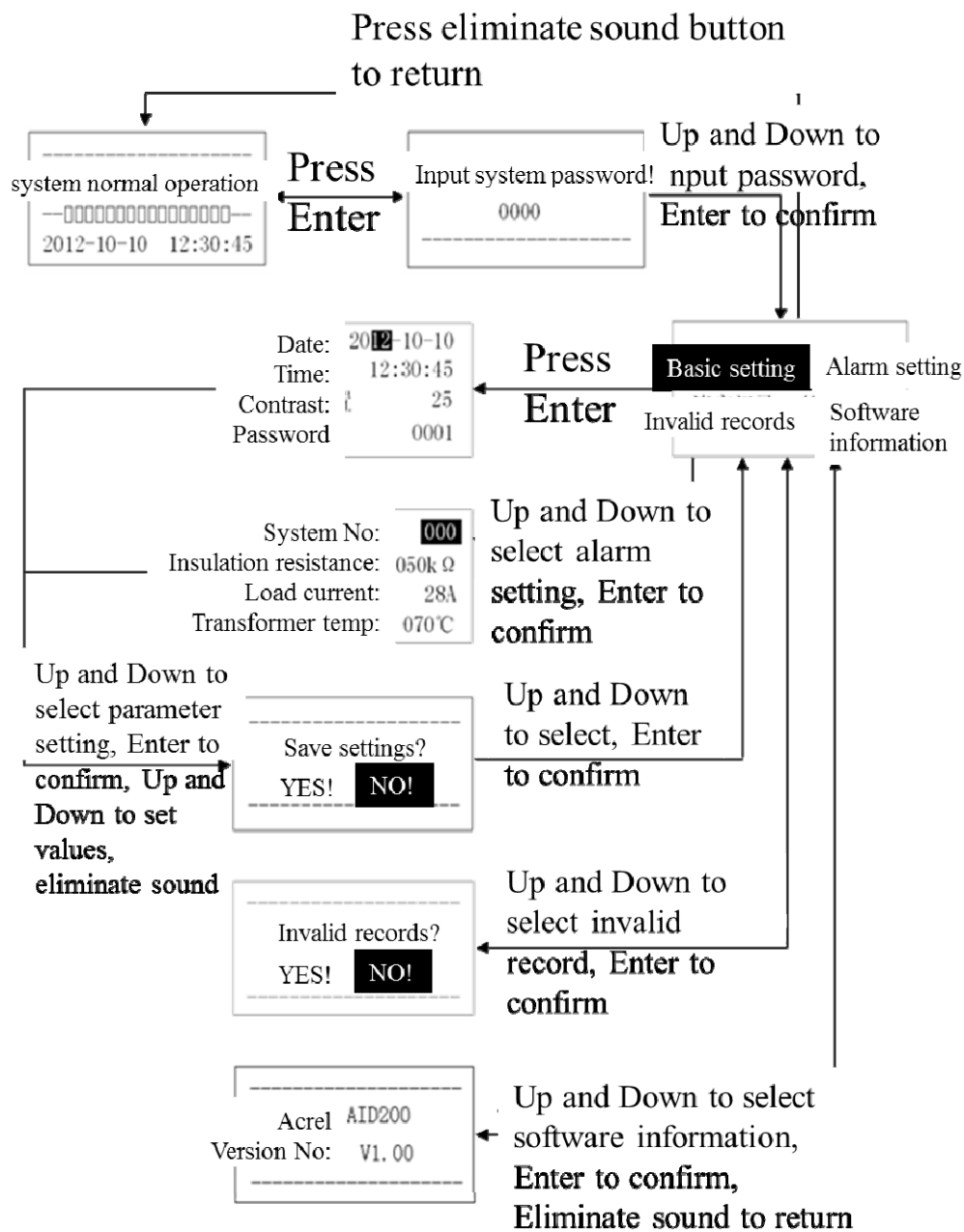
(1) 参数设置

(1) Parameter setting

编程步骤如下：

The programming steps are as follows:





(2) 仪表自检

(2) Instrument self-test

在主界面下，按下“自检”键，仪表将远程自检所接入的每套绝缘监测装置，所有的自检结果通过CAN通讯线路回传给集中报警与显示仪显示，按回车键返回正常界面。

In the main interface, press the "Self-test" button, and the instrument will conduct remote self-test of each set of insulation monitoring device connected to this instrument. All the self-test results will be returned back to centralized alarm and display instrument through the CAN communication wire to display, and press Enter button to return to the normal interface.

7 通信协议

7 Communication protocol

7.1 Modbus-RTU 通讯协议

7.1 Modbus-RTU communication protocol

7.1.1概述

7.1.1 Introduction

七件套产品中，AIM-M200绝缘监测仪与上位机之间的通讯使用了Modbus-RTU通讯协议，Modbus协议详细定义了校验码、数据序列等，这些都是特定数据交换的必要内容。Modbus协议在一根通讯线上使用主从应答式连接（半双工），这意味着在一根单独的通讯线上信号沿着相反的两个方向传输。首先，主计算机的信号寻址到一台唯一的终端设备（从机），然后，终端设备发出的应答信号以相反的方向传输给主机。

In seven pieces of products, the communication between the AIM-M200 insulation monitor and the upper computer uses the Modbus-RTU communication protocol. The Modbus protocol particularly defines the check code, the data sequences and so on, which are the necessary contents of the specific data exchange. The Modbus protocol uses a master-slave responsive connection (half-duplex) on a communication line, which means the signal on a single communication line is transmitted in two opposite directions. Firstly, the signal from the main computer is addressed to a unique terminal device (slave computer), and then the answering signal emitted from the terminal device is transmitted to the host in the opposite direction.

Modbus 协议只允许在主机（PC、PLC 等）和终端设备之间通讯，而不允许独立的终端设备之间的数据交换，这样各终端设备不会在它们初始化时占据通讯线路，而仅限于响应到达本机的查询信号。

The Modbus protocol only permits communication between hosts (PC, PLC, etc.) and terminal devices, without allowing the data interchange between independent terminal devices. So that terminal devices do not occupy communication lines when they are initialized and are limited to in response to the query signals arriving at the computer.

7.1.2 功能码简介

7.1.2 Introduction to the function code

7.1.2.1 功能码 03H 或 04H: 读寄存器

7.1.2.1 Function code 03H or 04H: Read the registers

此功能允许用户获得设备采集与记录的数据及系统参数。主机一次请求的数据个数没有限制，但不能超出定义的地址范围。

This function allows the user to acquire the data collected and recorded by equipment and the system parameters. The number of data requested by hosts has no limit, but cannot exceed the defined address range.

下面的例子是从 01 号从机读 1 个测量的绝缘电阻值，其绝缘电阻值的地址为 0008H。

The following example shows how to read a measured insulation resistance value from No.01 slave computer, with the address of the insulation resistance value of 0008H.

主机发送		发送信息	从机返回		返回信息
地址码		01H	地址码		01H
功能码		03H	功能码		03H
起始地址	高字节	00H	字节数		02H
	低字节	08H	寄存器数据	高字节	00H
寄存器数量	高字节	00H		低字节	50H
	CRC校验码	低字节	01H	CRC校验码	高字节
高字节		74H	低字节		75H
		低字节			
		0CH			

The host computer sends		Send message	The slave computer returns		Return message
Address code		01H	Address code		01H
Function code		03H	Function code		03H
Start address	High byte	00H	Bytes		02H
	Low byte	08H	Register data	High byte	00H
Number of registers	High byte	00H		Low byte	50H
	CRC check code	Low byte	01H	CRC check code	High byte
High byte		74H	Low byte		75H
		Low byte			
		0CH			

7.1.2.2 功能码10H: 写寄存器

7.1.2.2 Function code 10H: Write the registers

功能码 10H 允许用户改变多个寄存器的内容，该仪表中时间日期可用此功能号写入。主机一次最多可以写入 16 个（32 字节）数据。

The function code 10H allows the user to change the contents of multiple registers, which can write the time and date in this meter. The host can write up to 16 (32 bytes) data at a time.

下面的例子是预置地址为 01 的装置日期和时间为 09 年 12 月 01 日，星期五，12 点 00 分。其中周一到周日分别用 1 到 7 代替。

The following example shows a preset address of 01 with an installation date and time of 12:00, Friday, December 1st, 2009, in which the Monday to Sunday are replaced with number 1 to 7.

主机发送		发送信息
地址码		01H
功能码		10H
起始地址	高字节	00H
	低字节	04H
寄存器数量	高字节	00H
	低字节	03H
字节数		06H
0004H 待写入数据	高字节	09H
	低字节	0CH
0005H 待写入数据	高字节	01H
	低字节	05H
0006H 待写入数据	高字节	0CH
	低字节	00H
CRC校验码	高字节	53H
	低字节	3FH

从机返回		返回信息
地址码		01H
功能码		10H
起始地址	高字节	00H
	低字节	04H
寄存器数量	高字节	00H
	低字节	03H
CRC校验码	高字节	31H
	低字节	C9H

The host computer sends		Send message
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	04H
Number of registers	High byte	00H
	Low byte	03H

The slave computer returns		Return message
Address code		01H
Function code		10H
Start address	High byte	00H
	Low byte	04H
Number of registers	High byte	00H
	Low byte	03H

Bytes		06H
0004H Data to be written	High byte	09H
	Low byte	0CH
0005H Data to be written	High byte	01H
	Low byte	05H
0006H Data to be written	High byte	0CH
	Low byte	00H
CRC check code	High byte	53H
	Low byte	3FH

CRC check code	High byte	31H
	Low byte	C9H

7.1.3 医疗智能绝缘监测仪表内参数地址表

7.1.3 Parameter address table in medical intelligent insulation monitoring instrument

序号	地址	参数	读写属性	数值范围	数据类型
1	0000H	保护密码	R/W	0001-9999 (默认值为0001)	Word
2	0001H高字节	RS485通讯地址	R/W	1~247 (默认值为1)	Word
	0001H低字节	RS485通讯波特率	R/W	1~4: 4800、9600、19200bps(默认值为2)	
3	0002H高字节	CAN地址	R/W	1-110 (默认值为1)	Word
	0002H低字节	有无故障定位装置	R/W	1: 有, 0: 无(默认值为0)	
4	0003H高字节	LCD对比度	R/W	0-63 (默认值为0)	Word
	0003H低字节	背光时间	R/W	0:常开, 1-99 (单位为Min)	
5	0004H高字节	年	R/W	1-99	Word
	0004H低字节	月	R/W	1-12	
6	0005H高字节	日	R/W	1-31	Word
	0005H低字节	周	R/W	1-7	

7	0006H高字节	时	R/W	0-23	Word	
	0006H低字节	分	R/W	0-59		
8	0007H高字节	秒	R/W	0-59	Word	
	0007H低字节	保留	R			
9	0008H	绝缘电阻	R/W	10-999 (单位为KΩ)	Word	
10	0009H	负荷电流	R/W	0-500 (单位为0.1A)	Word	
11	000AH	变压器温度	R/W	40-140(单位为℃)	Word	
12	000BH高字节	故障回路		1-8	Word	
	000BH低字节	故障类型	R	Bit0:1 绝缘电阻故障 Bit1:1 过负荷故障 Bit2:1 变压器超温故障 Bit3:1 L1或L2断线故障 Bit4:1 PE或KE断线故障 Bit5:1 温度传感器断线故障 Bit6:1 电流互感器断线故障 (预留) Bit7:1 设备故障		
13-16	000CH-000FH	预留				
17	0010H	绝缘电阻值设定值	R	10-999 (单位为kΩ) (默认值为50)	Word	
18	0011H	负荷电流值设定值	R	0-50(单位为A) (默认值为35)	Word	
19	0012H	变压器温度值设定值	R	0-200(单位为℃) (默认值为70)	Word	
20-23	0013H-0016H	预留				
24	0017H高字节	预留	R		Word	
	0017H低字节	事件控制参数		下一个事件存放事件记录号		
25	0018H高字节	事件记	保留	R	Word	
	0018H低字节		STA1	R		事件1内容
26	0019H高字节		Year1	R	事件1时间-年	Word
	0019低字节		Moth1	R	事件1时间-月	
27	001AH高字节		Day1	R	事件1时间-日	Word
	001AH低字节		Hour1	R	事件1时间-时	

28	001BH高字节	录 1	Minut e1	R	事件1时间-分	Word
	001BH低字节		Secon d1	R	事件1时间-秒	
29-6 4	001CH-003FH	这部分空间存其余9条事件记录，规律和格式和第1条相同。				

No.	Address	Parameter	Read-write e property	Value range	Data type
1	0000H	Protecting passwords	R/W	0001-9999 (Default value is 0001)	Word
2	0001H high byte	RS485 Communication address	R/W	1~247 (Default value is 1)	Word
	0001H low byte	RS485 Communication BPS	R/W	1~4: 4800、9600、19200bps(Default It value is 2)	
3	0002H high byte	CAN address	R/W	1-110 (Default value is 1)	Word
	0002H low byte	There is fault location device or not	R/W	1: yes, 0: no (Default value is 0)	
4	0003H high byte	LCD contrast ratio	R/W	0-63 (Default value is 0)	Word
	0003H low byte	Backlight timeout	R/W	0: Normally open, 1-99 (Unit is Min)	
5	0004H high byte	Year	R/W	1-99	Word
	0004H low byte	Month	R/W	1-12	
6	0005H high byte	Day	R/W	1-31	Word
	0005H low byte	Week	R/W	1-7	

7	0006H high byte	Hour	R/W	0-23	Word
	0006H low byte	Minute	R/W	0-59	
8	0007H high byte	Second	R/W	0-59	Word
	0007H low byte	Reserve	R		
9	0008H	Insulation resistance	R/W	10-999 (Unit is KΩ)	Word
10	0009H	Load current	R/W	0-500 (Unit is 0.1A)	Word
11	000AH	Transformer temperature	R/W	40-140(Unit is °C)	Word
12	000BH high byte	Fault circuit		1-8	Word
	000BH low byte	Fault type	R	Bit0:1 Insulation resistance fault Bit1:1 Overload fault Bit2:1 Transformer overheat fault Bit3:1 L1 or L2 disconnection fault Bit4:1 PE or KE disconnection fault Bit5:1 Temperature sensor disconnection fault Bit6:1 Current transformer disconnection fault (preset) Bit7:1 Device fault	
13-16	000CH-000FH	Preset			
17	0010H	Insulation resistance set value	R	10-999 (Unit is kΩ) (Default value is 50)	Word
18	0011H	Load current set value	R	0-50(Unit is A) (Default value is 35)	Word
19	0012H	Transformer temperature set value	R	0-200(Unit is °C) (Default value is 70)	Word
20-2	0013H-0016H	Preset			

3							
24	0017H high byte	Preset		R		Word	
	0017H low byte	Event control parameters			The storage event record number of next event		
25	0018H high byte	Event record 1	Reserve	R		Word	
	0018H low byte		STA1	R	Event 1 content		
26	0019H high byte		Year1	R	Event 1 time -year	Word	
	0019 low byte		Moth1	R	Event 1 time -month		
27	001AH high byte		Day1	R	Event 1 time -day	Word	
	001AH low byte		Hour1	R	Event 1 time -hour		
28	001BH high byte		Minute1	R	Event 1 time -minute	Word	
	001BH low byte		Second 1	R	Event 1 time -second		
29-64	001CH-003FH		The rules and formats of the remaining 9 event records in this part of space are the same with event 1.				

7.2 CAN 通讯说明

7.2 CAN communication description

7.2.1概述

7.2.1 Introduction

在七件套产品中，AIM-M200绝缘监测仪、AIL100系列故障定位仪、ASG100测试信号发生器和AID200集中报警与显示仪之间的通讯采用CAN通讯，通讯速率为400kbps。基于CAN总线的特性，可能有多套AIM-M200绝缘监测仪和其它设备同时挂载在总线上，但在形式上，每一套由七件套元件组成的隔离电源系统内部，AIM-M200与AIL100故障定位仪、ASG100测试信号发生器组成一个CAN通讯子系统，他们的地址为同一地址，他们之间通过标识来区别。在同一条CAN总线上，可以有多套由AIM-M200、AIL100和ASG100组成的子系统，但只允许挂载一只AID200集中报警与显示仪。

In seven pieces of products, the communication between AIM-M200 insulation monitors, AIL100 series fault locator, ASG100 test signal generator and AID200 centralized alarm and display instrument uses CAN communication,

of which the communication rate is 400kbps. Based on the characteristics of CAN bus wire, there may be multiple sets of AIM-M200 insulation monitors and other devices simultaneously mounted on the bus wire. But in form, inside of each isolated power system consisting of the components in seven pieces of products, the AIM-M200, AIL100 fault locator and ASG100 test signal generator together constitute a CAN communication subsystem, whose addresses are the same and are distinguished by identification. On the same CAN bus wire, there can be multiple sets of subsystems consisting of AIM-M200, AIL100 and ASG100, but only a AID200 centralized alarm and display instrument is allowed.

7.2.2协议

7.2.2 Agreement

帧起始	仲裁段	控制段	数据段	CRC 段	ACK 段	帧结束
-----	-----	-----	-----	-------	-------	-----

Frame start	Arbitration segment	Control segment	Data segment	CRC segment	ACK segment	Frame end
-------------	---------------------	-----------------	--------------	-------------	-------------	-----------

当数据帧到达终端设备时，它通过一个简单的“端口”进入被寻址到的设备，该设备去掉数据帧的信封“信封”（数据头），读取数据，如果没有数据，就执行数据所请求的任务。然后，如果有返回的数据，则将自己生成的数据进行封包操作，装入到“信封”之中，把数据帧返回给发送者。

When the data frame reaches the terminal device, it enters the addressable device through a simple “port”. The device removes the envelope "envelope" (data header) of the data frame and reads the data. If there is no data, the task requested by the data is executed. Then, if the returned data is available, the data generated by itself is packed in the “envelope”, and the data frames are returned to the sender.

7.2.2.1 数据帧格式

7.2.2.1 Data frame format

7.2.2.2 帧起始

7.2.2.2 Frame start

表示帧开始的段，一个位的显性位。

Represent a segment that a frame starts, with dominant of a bit.

总线上的电平有“显性”与“隐性”两种。总线上执行逻辑上的线“与”时，显性电平的逻辑值为“0”，隐性电平的逻辑值为“1”。“显性”具有“优先”的意味，只要有一个单元输出显性电平，总线上即为显性电平，“隐性”具有“包容”的意味，只有所有单元输出隐性电平，总线上才为隐性电平。

The bus wire has two kinds of electrical levels which are “dominant” and “recessive”. When executing the line

“and” on the bus wire, the logical value of the dominant level is “0”, and the logical value of the recessive level is “1”. “Dominant” has the meaning of “priority”, as long as there is a unit outputting dominant level, the bus wire is the dominant level. “Recessive” has the meaning of “containment”, only when the output of all units is the recessive level, the bus wire is the recessive level.

7.2.2.3 仲裁段

7.2.2.3 Arbitration segment

表示数据优先级的段。

The segment representing the data precedence.

CAN 通讯协议中规定的数据帧有两种格式，标准格式和扩展格式，两种格式的仲裁段构成有所不同。安科瑞 AIM-M200 绝缘监测仪使用的是标准格式，标准格式的仲裁段有 11 个位，从 ID28 到 ID18 被依次发送，禁止高 7 位都为隐性。

The data frames stipulated in the CAN communication protocol have two formats, which are standard format and extended format, and the arbitration segments of the two formats are different. Acrel AIM-M200 insulation monitors uses the standard format, of which the arbitration segment has 11 bits. It is sent in turn from ID28 to ID18, and prohibits the high 7 bits are all recessive.

7.2.2.4 控制段

7.2.2.4 Control segment

控制段由6个位构成，表示数据段的字节数，标准格式和扩展格式的构成有所不同。

The control segment consists of 6 bits, representing the number of bytes in the data segment, and the composition of the standard format and the extended format is different.

安科瑞 AIM-M200 绝缘监测仪使用的是标准格式，包含一个 IDE 位，一个保留位，以及 4 各位的数据长度码 DLC。

The Acrel AIM-M200 insulation monitor uses the standard format, consisting of a IDE bit, a reserved bit, and 4 bits of data-length-code DLC.

注意的是，数据的字节数必须为 0-8 字节，但接收方对 9-15 的情况不视为错误。

Note that the bytes of data must be 0-8 bytes, but the receiver does not consider the case of 9-15 as an error.

7.2.2.5 数据段

7.2.2.5 Data segment

数据段可包含 0-8 个字节的数据，从 MSB（最高位）开始输出。

Data segment can contain data of 0-8 bytes, starting with the MSB (Most significant bit).

具体说明见 6.3.3 通讯应用。

Refer to 6.3.3 Communication application for detailed description.

7.2.2.6 CRC段

7.2.2.6 CRC segment

CRC 段是检查帧传输错误的帧，由 15 个位的 CRC 顺序和 1 个位的 CRC 界定符（用于分隔的位）构成。

The CRC segment is the frame that examines the frame transmission error, consisting of 15-bit CRC sequences and 1-bit CRC delimiter (the bit used for separation).

CRC 顺序是根据多项式生成的 CRC 值，CRC 的计算范围包括帧起始、仲裁段、控制段和数据段。接收方以同样的算法计算 CRC 并进行比较，不一致会通报错误。

CRC sequence is the CRC value generated by the polynomial, and the calculation range of CRC includes frame start, arbitration segment, control segment and data segment. The receiver calculates the CRC with the same algorithm and makes comparisons. If any inconsistencies, it will notify the error.

7.2.2.7 ACK段

7.2.2.7 ACK segment

ACK 段是用来确认接收是否正常。由 ACK 槽（ACK Slot）和 ACK 界定符两位构成。

The ACK segment is used to confirm that the reception is normal, consisting of two bits that are an ACK slot (ACK Slot) and an ACK delimiter.

发送 ACK 的是在既不处于总线关闭态，也不处于休眠态的所有接收单元中，接收到正常消息的单元（发送单元不发送 ACK）。所谓正常消息是指不含填充错误、格式错误、CRC 错误的消息。

An ACK is sent in the unit (the sending unit does not send an ACK) which can receive the normal message and belongs to one of all receiving units that are neither in the bus shutdown nor in hibernation. A normal message means a message that does not contain a stuff error, a formal error or a CRC error.

7.2.2.8 帧结束

7.2.2.8 Frame end

帧结束是表示该帧结束的段，由 7 个隐性位构成。

The frame end is a segment representing the end of the frame, consisting of 7 recessive bits.

7.2.3 通讯应用

7.2.3 Communication application

通讯中，一个数据帧可以分为多个作用各不相同的段，除数据段外，其他段的含义已在上节说明，故本节不再详述，本节只介绍数据段信息。

In communication, a data frame can be divided into multiple segments with different functions. Except for the data segment, the meaning of the other segments has been explained in the previous section, so this section will not explain in detail, and only describes the information of data segment.

本节所举实例数据位 16 进制。数据段采用命令（功能码）+数据的格式。

The data bits of the example given in this section are hexadecimal. Data segment takes the format of the command (function code) + data.

7.2.3.1 启动命令

7.2.3.1 Startup command

01 01

01 01

说明：AIM-M200 绝缘监测仪监测到隔离电源系统中有绝缘故障时，会发出启动命令，启动 AIL100-4 故障定位仪。AIL100-4 故障定位仪收到此命令后，开始绝缘故障定位。

Description: When the AIM-M200 insulation monitoring instrument monitors the insulation faults in the isolated power system, it will issue a startup command to initiate the AIL100-4 fault locator. After receiving this command, the AIL100-4 fault locator begins the insulation fault locating.

7.2.3.2 返回故障定位结果命令

7.2.3.2 Fault location results return command

04 01

04 01

说明：AIL100-4 绝缘故障定位完成后，将定位结果发送给 AIM-M200 医疗智能绝缘监测仪。

Description: After the AIL100-4 insulation fault locating is completed, the locating results are sent to the AIM-M200 medical intelligent insulation monitoring instrument.

其它命令这里不再赘述。

Other commands will not be repeated here.

7.3 仪表 CAN 通讯连接和地址设置

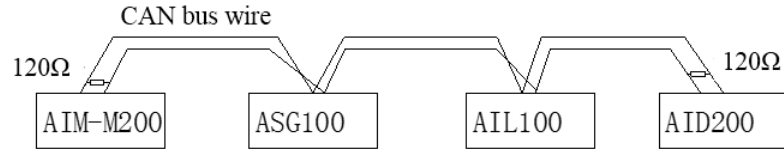
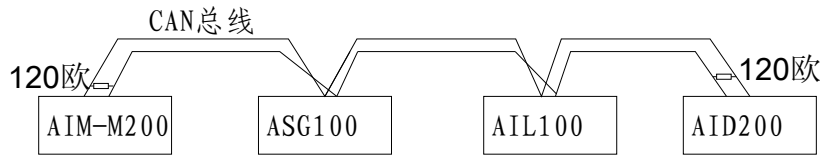
7.3 Instrument CAN communication connection and address settings

如 8.2.1 所述，每一套 AIM-M200、ASG100 和 AIL100 在形式上为一个子系统，在实际应用时，应按以下方式对 CAN 通讯连接和地址设置。

As shown in 8.2.1, each set of AIM-M200, ASG100 and AIL100 serve as a subsystem formally, while in practical application, the CAN communication connection and address settings should be conducted in the following ways.

1) 如果只有一套 IT 系统，则可直接用屏蔽双绞线按下图连接。注意 CAN 总线两个末端各加 1 个 120Ω 的匹配电阻。

1) If only there is a set of IT system, you can directly use the shielded twisted pair to connect according to the picture below. Note each of the two terminals of the CAN bus wire should be added a matched resistance of 120Ω.



设置 CAN 地址时，在 4 只仪表统一上电后，只需将 AIM-M200 的 CAN 地址设置为 1-110 内任意值，保存后便可同时将 ASG100、AIL100 的 CAN 地址设置为与 AIM-M200 相同的地址。在确认 AIM-M200 的 CAN 地址保存过程中，注意查看 ASG100 和 AIL100 的通讯指示灯是否闪烁几次，若闪烁，则地址设置正常，否则，需检验通讯接线并确认接线完好后再重新设置。AID200 的 CAN 地址不需要设置。

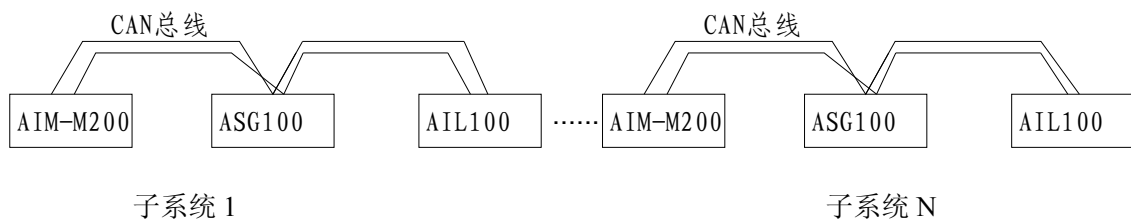
When setting CAN address, in, it is only needed to set the CAN address of AIM-M200 to any value between 1 to 110 after the 4 meters are on a unified power, then save the value and the CAN address of ASG100, AIL100 can be simultaneously set the same with address of AIM-M200. In the confirmation of saving the AIM-M200 CAN address, note whether the communication lights of ASG100 and AIL100 are flashing several times. If flashing, the address settings are normal, otherwise, it is needed to check the communication wiring and confirm that the wiring is intact and then reset. The CAN address of AID200 does not need to be set.

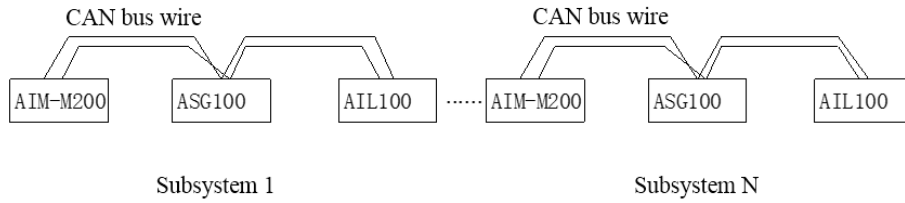
2) 如果同时有多套 IT 系统，且多套 IT 系统共用 1 个 AID200 集中报警与显示仪，则接线和设置地址应按严格按以下步骤进行：

2) If there are multiple sets of IT systems at the same time which share one AID200 centralized alarm and display instrument, the wiring and address settings should be conducted in strict accordance with the following steps:

I) 先用屏蔽双绞线将各 IT 系统的 AIM-M200、ASG100 和 AIL100 按下图单独连接起来，并确保不同子系统之间的 CAN 通讯是断开的；

I) Firstly, separately connect the AIM-M200, ASG100 and AIL100 of each IT system are by shielding twisted pair, and confirm that the CAN communication between different subsystems is disconnected.



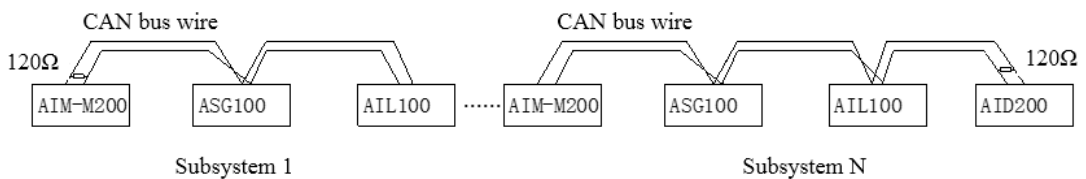
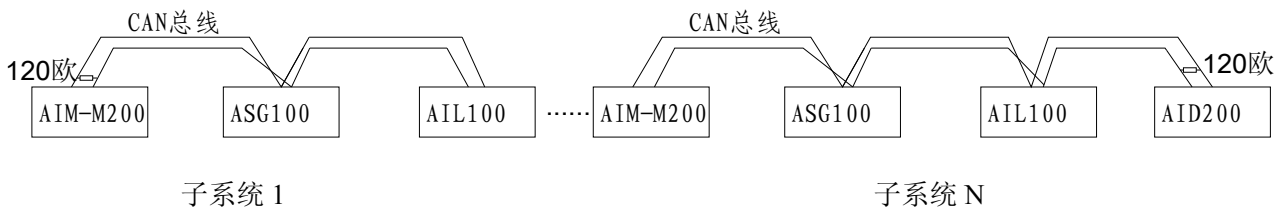


II) 上电并依次按从 1 到 N 的顺序设置各子系统的 AIM-M200 的 CAN 地址，注意 CAN 地址不能重复。设置地址时，应确保每个子系统的 3 种仪表都处于上电状态。

II) Power on and sequentially set the AIM-M200 CAN address of each subsystem in the order from 1 to N, noting that CAN address cannot be duplicated. When you set up an address, you should ensure that the 3 meters of each subsystem are in power.

III) 由于每个 AID200 最多只能监控 16 套 IT 系统，如果 N 小于 16，则直接将各子系统用屏蔽双绞线连接起来，最后再接到 AID200 上，注意加 120Ω 的终端匹配电阻，如下图所示：

III) Since each AID200 can only monitor 16 sets of IT systems, if N is less than 16, the subsystems are directly connected together with shielded twisted pairs, and are finally connected to the AID200. Pay attention to add the terminal matching resistor of 120Ω, as shown in the following picture:



如果 N 大于 16 套，则应按顺序将每 16 套接 1 个 AID200 集中报警与显示仪，接法与上图相同。如果 N 大于 110(CAN 地址设置的最大允许值)，则 110 以后的子系统的地址应从 15 开始设置，以确保每套 AID200 所有监控的仪表地址除以 16 所取的余数不会重复。

If N is larger than 16 sets, you should sequentially connect one AID200 centralized alarm and display instrument with each 16 sets, of which the connection method is the same as above. If N is larger than 110 (maximum allowable value for CAN address settings), the address of the subsystems after 110 should be set from number 15 to ensure that the remainder of all monitored instrumentation addresses of each set of AID200 divided by 16 is not

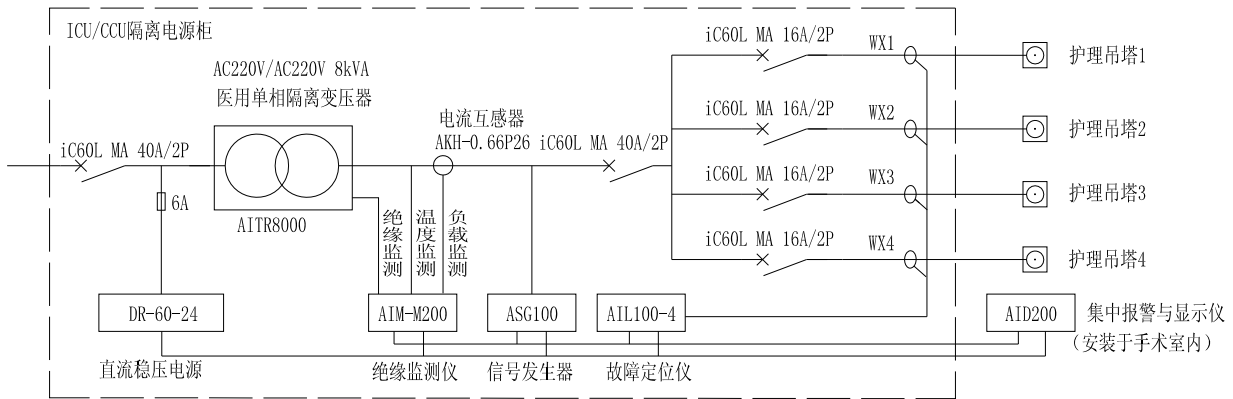
duplicated.

8 典型应用

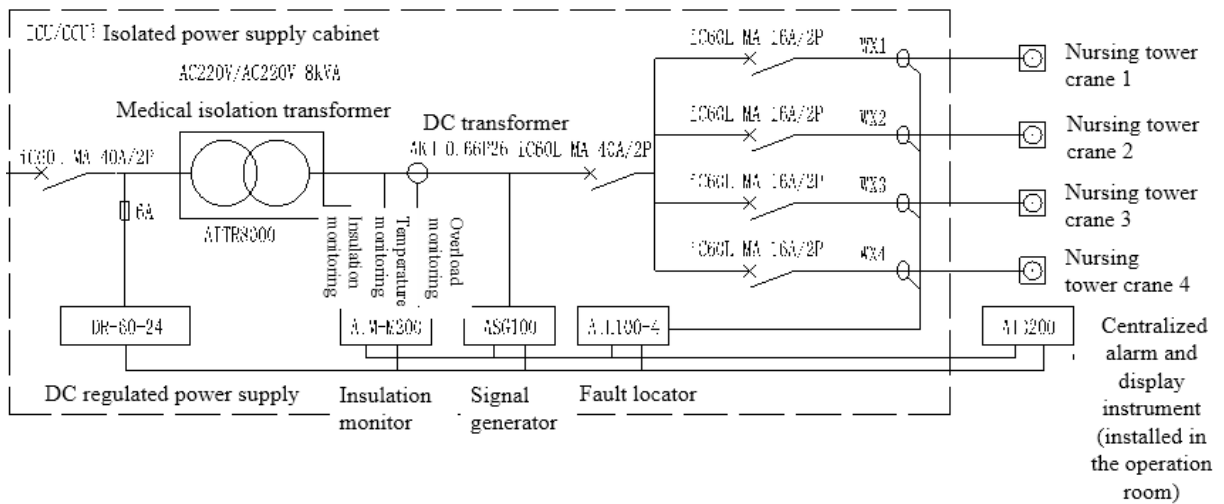
8 Typical applications

8.1 绝缘监测及故障定位七件套产品在 ICU/CCU 的应用

8.1 Applications of insulation monitoring and fault locating seven pieces of products in ICU/CCU



注：隔离电源柜内的接地排应与现场的等电位端子排可靠连接。



Note: The grounding bat in the isolated power supply cabinet should be connected reliably with the equipotential terminals in the field.

9 上电及调试说明

9 Powerup and debugging instructions

9.1 接线检查

9.1 Wiring check

每一套IT系统在上电前都要先进行接线检查，主要检查有没有错接、漏接或短接等。可对照本说明书第5.4部分所示的接线图按以下顺序依次检查：

For each set of IT system, the wiring check should be conducted before powerup, mainly checking whether there is wrong, missed or short connection. The examination can be conducted sequentially in the following order according to the wiring diagrams shown in section 5.4 of this manual:

1) 检查每一个七件套是否组成一套独立的IT配电系统，确保每一台绝缘监测仪监测的电流、电阻和温度信号接线接到同一台隔离变压器及其组成的IT系统上。

1) Check if each seven-piece suite forms a separate IT distribution system, and ensure that the current, resistance, and temperature signal wirings of each insulation monitor are connected to the same isolation transformer and IT system composed of it.

2) 检查每一套中DR-60-24电源模块的L、N输入端是否接到隔离变压器的一次侧0、230V端子上。其24V输出端的+V、-V是否分别与AIM-M200的1（24V）、2(G)号端子，ASG100的8（24V）、9（G）号端子，AIL100-4(或-8)的1（24V）、2号（G）端子，AID200的24V、G号端子可靠相连，且正负极无误。

2) Check whether the L and N input terminals of each set of the DR-60-24 power supply module are connected to the 0 and 230V terminals of primary side of the isolated transformer. Whether the +V and -V of its 24V output terminal is respectively connected with the No.1(24V) and 2(G) terminals of AIM-M200, No.8(24V) and 9(G) terminals of ASG100, No.1(24V) and 2 (G) terminals of AIL100-4(or-8), No.24V and G terminals of AID200, and the positive and negative poles are all correctly connected.

3) 检查每一套系统中的AIM-M200的8（I0）、9（I1）号端子是否可靠连接到对应隔离变压器的二次侧套接的互感器AKH-0.66P26的端子上，且不接地，该互感器只穿过隔离变压器输出端两根线的其中一根线。

3) Check whether the No.8(I0) and 9(I1) terminals of AIM-M200 in each system are reliably connected to the terminals of the transformer AKH-0.66P26 socketed to the secondary side of the corresponding isolation transformer, and are not grounded. The transformer only passes one of the two lines of the output terminals of the isolation transformer.

4) 检查每一套系统中的AIM-M200的No.11（T0）、12(T1)号端子是否与隔离变压器的两个ST端子相连接，并可靠连接。

4) Check whether the No.11(T0) and 12 (T1) terminals of AIM-M200 in each system are reliably connected to the two ST terminals of the isolation transformer.

5) 检查每一套系统中的AIM-M200的4 (L1)、5 (L2) 号端子以及ASG100的3 (L1)、5(L2)号端子是否与IT系统（即隔离变压器的二次侧）的两根线可靠连接。

5) Check whether the No.4 (L1), 5 (L2) terminals of AIM-M200 and No.3 (L1), 5 (L2) terminals of ASG100 in each of the systems are reliably connected to the two lines of the IT system (that is the secondary side of the isolation transformer).

6) 检查每一套系统中的AIM-M200的第13 (FE)、14(KE)号端子是否分别用导线连接到现场的等电位端子排上，同时隔离变压器的S端子，ASG100的1 (PE) 号端子是否与等电位端子排可靠连接。

6) Check whether the No.13 (FE), 14 (KE) terminals of AIM-M200 in each system are respectively connected to the on-site equipotential terminals through wires, in the meanwhile the S terminals of isolation transformer and the No.1 (PE) terminals of ASG100 are reliably connected to the equipotential terminals.

7) 检查每一套系统中的AIM-M200仪表CAN通讯的18 (H)、19(L)号端子是否分别与ASG100的11 (H)、12 (L) 号端子，AIL100-4(或-8)的22 (H)、23 (L) 号端子，以及AID200的CAH、CAL端子以手拉手的方式可靠连接，且正反无误。

7) Check whether the No.18 (h), 19 (L) terminals of AIM-M200 meter CAN communication in each system are respectively connected to the No.11 (h), 12 (L) terminals of ASG100, No.22 (h), 23 (L) terminals of AIL100-4 (or-8), and the CAH, CAL terminals of AID200 in the way of hand in hand, which are reliable connections with the positive and negative poles correct.

8) 如果每一台隔离变压器有散热风扇，则检查该散热风扇电源的控制是否连接到该套系统中AIM-M200的20、21号端子上。

8) If each isolation transformer has a cooling fan, check whether the cooling fan power supply control is connected to the No.20, 21 terminals of AIM-M200 in this system.

9) 最后检查每套IT系统中的各支路负载供电的两根线，是否均由上而下穿过AIL-4(或-8)仪表面板的互感器。

9) Finally check the two load power lines of each branch in the IT system, and check whether the two lines pass through the transformer on the AIL-4 (or-8) meter panel by a top-down approach.

9.2 常见故障与排除

9.2 Common faults and eliminations

确保接线正确无误后，给系统上电。上电后查看各仪表是否异常，AIM-M200是否有故障报警，对于常见的问题，可根据各仪表的现象及故障类型判断原因并进行故障排除：

Make sure the wirings are correct and power on the system. Then check whether each meter is abnormal, and whether there is a fault alarm in AIM-M200. For common problems, the causes can be determined and the faults can be eliminated according to the phenomenon of each instrument and the fault types:

设备名称	故障现象	可能的原因及其排查
AIM-M200 绝缘监测仪	液晶显示：LL断线故障，绝缘指示灯亮	AIM-M200的4、5号端子没有可靠连接到隔离变压器的输出端的两根线上，检查接线并确保可靠其连接。
	液晶显示：FK断线故障，绝缘指示灯亮	AIM-M200的13、14号端子没有可靠连接到等电位端子排上，检查接线并确保其可靠连接。
	液晶显示：TC断线故障，超温指示灯亮	AIM-M200的11、12号端子没有与隔离变压器的两个ST端子可靠连接，检查接线并确保可靠其连接。
	液晶显示：绝缘故障，绝缘指示灯亮	隔离变压器二次侧的IT系统的两根线中至少有一根出现接地故障，排除后即可恢复正常。
	仪表不亮	AIM-M200的24V工作电源没有接好，检查1、2号端子接线并确保其可靠连接。
DR-60-24仪 用电源	上电指示灯不亮	检查220V电源输入接线是否正常，两端子间电压是否在允许输入的范围之内。
ASG100测试 信号发生器	仪表不亮	24V工作电源没有接好，检查8、9号端子接线是否正常，并重新接线。
	测试指示灯亮红色	3、5号端子没有与隔离变压器二次侧可靠连接，重新接线，直到上电后该指示灯变成绿色。
AIL100-4/-8 故障定位仪	仪表不亮	24V工作电源没有接好，检查1、2号端子接线是否正常，并重新接线。
	绝缘故障时不能定位	1) 与系统中其它仪表的通讯线没接好，对通讯线进行排查，并确认匹配电阻是否接好。 2) CAN地址没有设置好，需断开与其相连的其它系统仪表的CAN总线后，通过与其对应的绝缘监测仪重新设置CAN地址

		。
		3) 仪表问题, 需返回厂家解决。
AID200集中报警与显示仪	仪表不亮	24V工作电源没有接好, 检查24V、G端子接线是否正常, 并重新接线。
	通讯指示灯不闪烁	1) AIM-M200没有打开定位功能, 进入AIM-M200的通讯设置菜单, 将LOCAT项设置成YES, 退出保存, 即可启动该功能。重新上电再次确认通讯是否正常。 2) 与系统中其它仪表的通讯线没接好, 对通讯线进行排查, 并确认匹配电阻是否接好。

注意: 出现以上故障, 均断电排查, 调整接线, 直到一切正常为止。

Equipment name	Fault phenomenon	Possible causes and troubleshooting
AIM-M200 insulation monitoring instrument	Liquid crystal display: LL disconnection fault, and the insulation indicator is lit.	No.4 and 5 terminals of AIM-M200 are not reliably connected to the two lines of the output terminal of the isolation transformer. Check the wirings and make sure they are reliably connected.
	Liquid crystal display: FK disconnection fault, and the insulation indicator is lit.	No.13 and 14 terminals of AIM-M200 are not reliably connected to the equipotential terminals. Check the wirings and make sure they are reliably connected.
	Liquid crystal display: TC disconnection fault, and the overheat indicator is lit.	No.11 and 12 terminals of AIM-M200 are not reliably connected to the two ST terminals of the isolation transformer. Check the wirings and make sure they are reliably connected.
	Liquid crystal display: insulation fault, and the insulation indicator is lit.	At least one of the two lines in the IT system at the secondary side of the isolation transformer has a grounding fault, after elimination it can be restored to normal.
	The instrument is not lit.	The 24V power supply of AIM-M200 is not connected well. Check

		the wirings of No.1 and 2 terminals and make sure they are reliably connected.
DR-60-24 power supply module	Powerup indicator is not lit.	Check whether the wirings of 220V power input are normal and whether the voltage between the two terminals is within the allowable input range.
ASG100 test signal generator	The instrument is not lit.	The 24V power supply is not connected well. Check the wirings of No.8 and 9 terminals and rewire.
	Test indicator is red.	No.3 and 5 terminals are not reliably connected to the secondary side of the isolation transformer. Rewire until the indicator turns green after powerup.
AIL100-4/-8 fault locator	The instrument is not lit.	The 24V power supply is not connected well. Check the wirings of No.1 and 2 terminals and rewire.
	Unable to locate the insulation fault	<ol style="list-style-type: none"> 1) The communication line with other instruments in the system is not connected well. Troubleshoot the communication line and confirm whether the matching resistors are well connected. 2) The CAN address is not set up properly. Disconnect the CAN bus of other connected system instruments, and reset CAN address through its corresponding insulation monitoring instrument. 3) Instrument problem, which is needed to return to the factory to be solved.
AID200 centralized alarm and display instrument	The instrument is not lit.	The 24V power supply is not connected well. Check the wirings of 24V and G terminals and rewire.
	Communication indicator does not flash	<ol style="list-style-type: none"> 1) AIM-M200 does not open the positioning function. Enter the AIM-M200 communication settings menu and set the LOCAT item to YES, then quit and save to start this function. Re-power and confirm whether the communication is normal again. 2) The communication line with other instruments in the system is not connected well. Troubleshoot the communication line and confirm whether the matching resistors are well connected.

Note: If the above faults occur, interrupt the power to troubleshoot, and adjust the wirings until everything is normal.

9.3 设置及调试

9.3 Settings and debugging

1)系统正常上电后，需根据隔离变压器的容量，设置AIM-M200负载电流报警值，报警电流与隔离变压器容量的对应关系为：45A---10kVA、35A---8kVA、28A---6.3kVA、14A---3.15kVA。设置完后按步骤一步一步退出，保存设置参数即可。仪表默认电流报警值为35A，如果配套的变压器为8kVA，则该项参数不用设置。

1) After the system is powered on, set the AIM-M200 load current alarm value according to the capacity of the isolation transformer. The corresponding relations between alarm current and isolation transformer capacity are: 45A---10kVA, 35A---8kVA, 28A---6.3kVA, 14A---3.15kVA. After you set up, follow the process step by step to exit and save the setting parameters. The default alarm current value of the instrument is 35A, if the matching transformer is 8kVA, then this parameter does not need to be set.

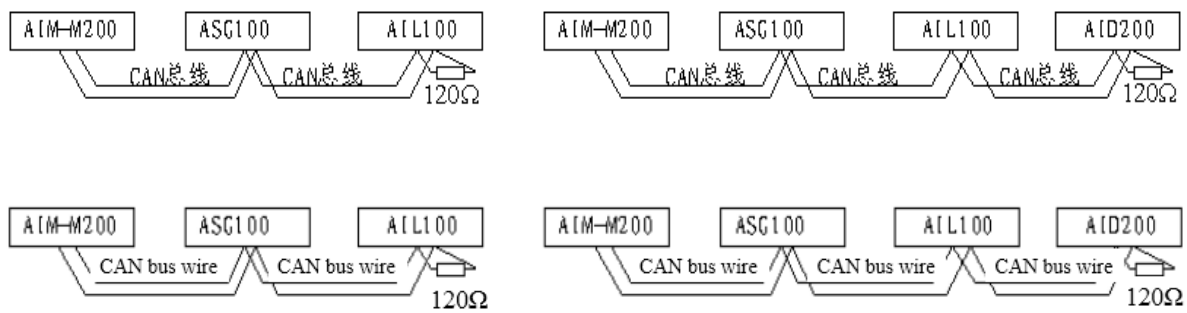
2)打开AIM-M200故障定位功能。进入AIM-M200的通讯设置菜单，将LOCAT项设置成YES，退出保存，即可启动该功能。

2) Open the AIM-M200 fault locating function. Enter the AIM-M200 communication settings menu and set the LOCAT item to YES, then quit and save to start this function.

3)通讯地址设置。为保证故障定位功能的实现，需设置AIM-M200的CAN通讯地址，并通过该操作设置ASG100和AIL100的CAN通讯地址。设置前要确保同一套IT系统内的AIM-M200、ASG100、AIL100等产品的CAN总线接线无误，并在末端并一只120Ω的匹配电阻（该电阻必须加，不然可能无法通讯。也可以将AIL100接在CAN总线的首端或末端，并将其拨码开关全部拨至“1”的位置），如下图所示。依次分别对每一套系统上电（保证在同一CAN网络内，不能出现多只ASG100或AIL100），然后进入AIM-M200的通讯设置菜单，设置CAN通讯地址，按回车键确认后，按自检键返回并保存。如果保存的过程中ASG100和AIL100的通讯指示灯闪烁，说明ASG100和AIL100的CAN通讯地址也设置成功。地址的编号从1开始。AID200不需要设置CAN地址。特别注意：为确保地址设置成功，在设置CAN地址的过程中，仅允许正在设置的那套系统（七件套）处于上电状态，已设置好的和未设置的七件套系统都应处于断电状态。（或确保在设置过程中，每一套隔离电源系统的AIM-M200、ASG100和AIL100处在同一条独立的CAN总线上，与其它隔离电源系统的CAN总线完全断开。）

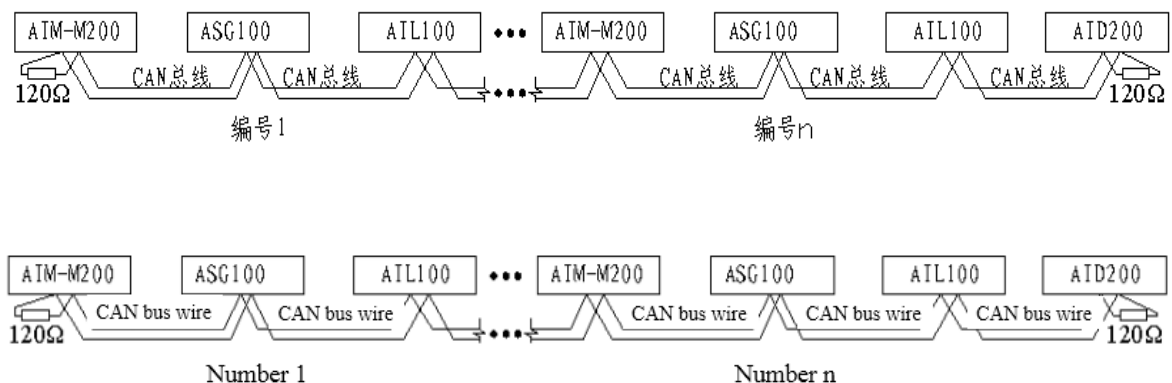
3) Communication address settings. In order to ensure the realization of the fault locating function, you need to set the CAN communication address of AIM-M200, as well as the CAN communication address of ASG100 and AIL100. Before setting, ensure that the CAN bus wiring of AIM-M200, ASG100, AIL100 and other products in the same set of IT system is correctly connected, and connect a 120 Ω matching resistance at the end in parallel (The resistance must be added, or it may be unable to communicate. You can also connect the AIL100 to the head or end of the CAN bus wire and dial all of the switches to the position “1”), as shown in the picture below. Each system is powered on one by one (make sure that there should not be more than one ASG100 or AIL100 in the same CAN network), then enter the AIM-M200 communication settings menu to set CAN address, and press ENTER for confirmation, and press the

Self-Test button to return and save. If the ASG100 and AIL100 communication indicator is flashing during the saving process, the CAN communication address of ASG100 and AIL100 is also successfully set. The number of the address starts from No.1. AID200 does not need to set CAN address. Special notice: To ensure the address settings are successful, when setting CAN address, only the system (seven pieces) which is being set is allowed to be powered on, and seven pieces of systems which have been set or have not been set should be off power. (Or ensure that AIM-M200, ASG100, and AIL100 of each set of isolation power system are on the same independent CAN bus wire and are completely disconnected from the CAN bus wire of other isolation power systems during the setting process.)



如果多套系统采用了1只AID200实现报警参数进行集中监测，则在每套绝缘监测仪依次设置完地址后，再将各套系统仪表的CAN总线以手拉手的形式连接起来，中间的匹配电阻全部去掉，只在新的CAN总线的首末端各加1只120Ω的匹配电阻，接线形式如图2所示。

If more than one system adopts one AID200 to realize the alarm parameter centralized monitoring, then after setting of each insulation monitor in turn, connect CAN bus wire of each set of system instruments through hand in hand approach, and remove all the matching resistance in the middle, while add one 120Ω matching resistance at each head and end of the new CAN bus wire. The wiring form is shown in Figure 2.



最后将所有IT系统全部上电，查看AID200运行界面，如果其所与监控的各套绝缘监测仪CAN通讯正常，则在运行界面下面的一排对应序号的小方格为黑色实心方格，如果某方格为空心方格，则说明与该序号方格对应的绝缘监测仪没有建立通讯或通讯不正常，可通过两种方式重新建立通讯：

Finally, make all IT systems powered on, and check the AID200 running interface. If its CAN communication with

each set of insulation monitoring instrument is normal, a line of small squares with corresponding number under the running interface are black solid squares. If one of the squares is a hollow square, the insulation monitor corresponding to this number square does not establish communication or the communication is abnormal. Then you can re-establish communication in two ways:

1)、在AIM-M200正常运行界面下，按向下键，直到看到“向AID200注册地址”界面，再按下确认键；

1), Under the normal running interface of AIM-M200, press the DOWN ARROW button until you see the “Register Address to AID200” interface, and then press the confirmation button;

2)、在AID200正常运行界面下，按向下盘，直到看到“发送注册地址命令”界面，再按确认键。操作完后，再次查看对应位置的小方格是否变为实心，如果仍为空心，则可能是通讯线路问题，需断电检查和确认。

2), Under the normal running interface of AID200, press the DOWN ARROW button until you see the “Send the Registered Address Command” interface, and then press the confirmation button. After the operation, again check whether the small square in the corresponding position becomes solid. If still hollow, there may be the problems in communication wiring, and you need to interrupt the power to check and confirm.